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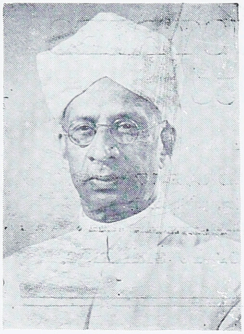

FOREWORD

by

Dr. S. RADHAKRISHNAN, M.A., D.LITT., LL.D., F.B.A.

VICE - PRESIDENT
INDIA

NEW DELHI
May 9, 1958

In a country like ours which is largely undeveloped, planned development is essential.

In this development the two sectors, private and public, will have to supplement each other and raise production, but the basis of all developments in the country is the stepping up of agricultural production.

We should not neglect it.

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PROSPERITY THROUGH PLANNING

There has been no lack of critics at home and abroad to belittle India's Planning and to impugn her motives. But our industrial achievement confounds them.

Since 1947, dynamic changes have taken place. Look where you will. You will find a feverish haste to grow industrially strong. We have grown more factories. The Industrial Estates hum with activity. We have put a stop to stagnation, opened more schools and hospitals; built mighty dams and harnessed rivers. Poverty of the masses is slowly being given a lie. There is not an idle ryot who stands out as a silent spectator to the great revolution that is changing the entire rural setup.

For several centuries past, India had not moved a muscle to activate industrialism. Tatas and Birlas were the early comers but only 1947 saw the resuscitation: the result being a colourful mosaic—the arteries of railways covering half a million hamlets; Indian airlines ribboning the blue; huge curls of smoke winding round and round from the factories of Jamshedpur, Chittaranjan, Sindri, Ahmedabad, Bombay, Calcutta, Bangalore and Coimbatore and a host of other trade centres, throbbing the quick pulse of gain; our ships touching the shores of forlorn seas and the wisdom voice of "Nehru" India heard with silent reverence and adoration in the councils of nations at all political, economic and social deliberations.

If this is not progress, what else is?

The progress we have achieved so far may not be in line with the phenomenal economic growth of a Japan or a Federal Germany. True, they started from nothing and proved that there can be no defeat to human endeavour. But the United States put them on the industrial map of the world by injecting several billions of dollars into their economy and helped them reach the forefront in a shorter period.

Russia struck a new path to compete and outstrip the West. But their ideologies run counter to our way of thinking and achieving our objectives.

Our ways are different.

Without shedding a drop of blood, we won our independence. Partition left many scars on our political and social visage. And what we have achieved so far is real history.

As our dear Nehruji says: "Machines and robots are, no doubt, the symbols of human prosperity in this age of rapid advancement, but one must take care that in adopting these agencies they remained slaves of man and not the other way round. Particular care should be taken that in accepting modern techniques no unemployment is brought about. India

was and would be a land of paradoxes and while she would take full advantage of automation and atomic energy for peaceful reconstruction and industrialization, the takli, the charkha and the bullock cart would also continue to exist side by side."

A 60 percent increase in industrial production during the past ten years is not a small achievement. A close study of the following table will bear eloquent testimony to our progress:

	Production in 1947	*Rate of Production in 1957*
Textiles	3,760 m. yds	5,500 m. yds.
Vanaspati	95,000 tons	3,20,000 tons
Sugar	10.75 lakh tons	20.1 lakh tons
Salt	19 ,, ,,	57 ,, ,,
Sulphuric Acid	60,000 tons	1,65,000 tons
Caustic Soda	3,000 tons	43,000 ,,
Soda Ash	14,000 tons	93,000 ,,
Amm. Sulphate	21,000 tons	3,65,000 ,,
Super Phos.	5,000 tons	1,25,000 ,,
Radios	3,000 nos.	1,50,000 Nos.
Sewing Machines	6,000 Nos.	1.66 lakh Nos.
Bicycles	49,000 Nos.	6.95 lakh Nos.
Automobiles	nil	35,000 Nos.
Diesel Engines	700 Nos.	18,000 Nos.
Power Driven Pumps	6,000 Nos.	58,000 Nos.
Electric Motors	38,000 H.P.	5 lakh H.P.
Electric Fans	1,60,000 Nos.	4,86,000 Nos.
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Transformers	32,000 KVA	13,00,000 KVA
Rubber Cables	22 m. core yds. (1948)	100 m. core yds.
Storage Batteries	70,000 Nos.	3,20,000 Nos
Coal	30m. tons	44 m. tons
Steel	8.5 lakh tons	13.4 lakh tons
Cement	14 lakh tons	61 lakh tons
Machinery	nil	Rs. 35 crores

And by the end of the Third plan *i.e.* 1966, we aspire to produce 15 million tons of steel. That day will witness the industrial prosperity of India in full bloom and our national income will shoot up to Rs. 30,000 crores a year and our per capita income will be practically doubled.

By then we will have a heavy machine-building plant to produce machinery for steel works, heavy chemical plants, cement machinery and other heavy industries; a foundry forge shop; a heavy machine tools plant; a plant to manufacture heavier items of mining equipment; a heavy structural works and a plate and vessel shop. A heavy electrical project for turbines and electric equipment is already established at Bhopal.

Private Sector is playing a vital part in building up a New India. As Mr. Eugene Black, Chairman of World Bank, said: "I should like first to emphasise once again my conviction that India's interests lie in giving private enterprise, both Indian and foreign, every encouragement to make its maximum contribution to the development of economy, particularly in the industrial field." In our mixed economy, both Sectors have their great parts to play and more Government sympathy to the Private Enterprise will spell greater prosperity to the nation.

In our march to the determined goal, we are happy Americans, Britishers, Russians, French, Japanese, Canadians, Czechs, Italians, Rumanians and other good neighbours are helping us to build a better India with their aids, loans and knowhow. We are happy they share with us our joys and sorrows. And we are happy to have them in our midst at every step.

We will win.

*

Krishna Srinivas

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IRON AND STEEL INDUSTRY

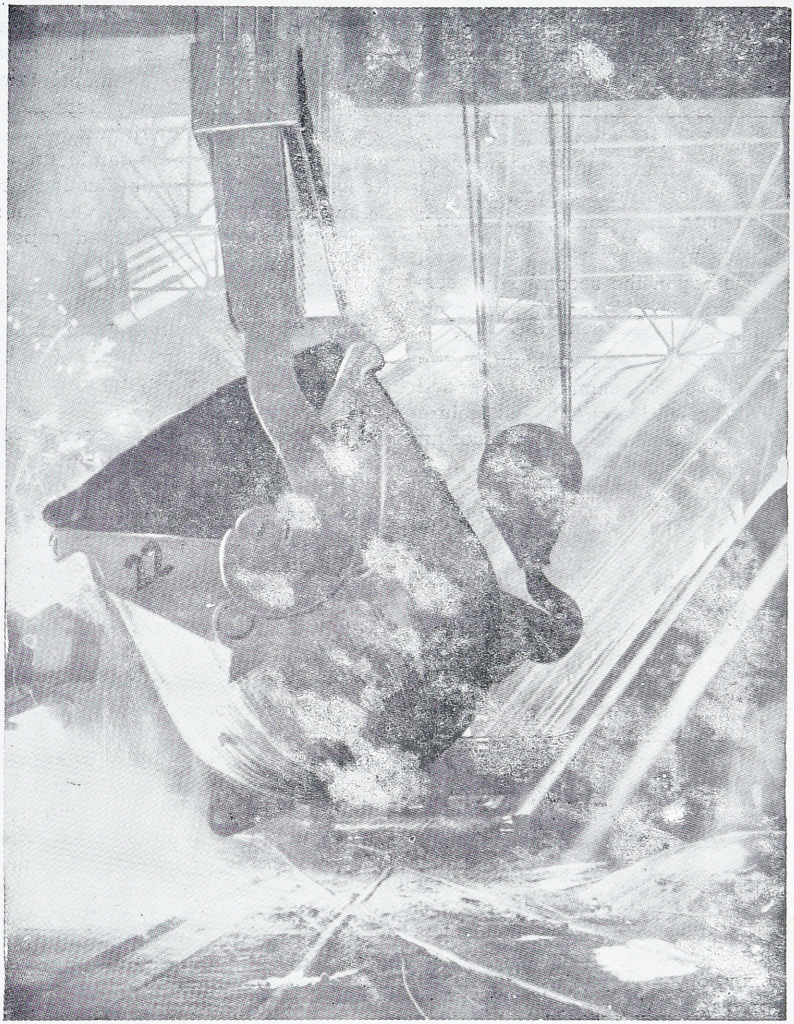
J. R. D. TATA

Chairman, Tata Iron & Steel Company, Limited, Jamshedpur

Had it not been for the name and prestige of Jamsetji Tata and his sons, Dorab and Ratan, backed by their faith and determination, many more years would have passed before the steel industry was established in India. Amongst the patriots and leaders of his generation Jamsetji, more than anyone else, realised that political freedom without economic and industrial strength to support and defend it would be a cruel delusion, and that the foundations of industrial power were made of steel.

It is proper, therefore, as we look back today upon a half century of progress, that we should pay tribute to the memory of Jamsetji Tata and also remember the part played by his sons and others who are no more, including R. D. Tata, B. J Padshah, John Peterson, Nowroji Saklatvala and Ardeshir Dalal.

In the fifty years of our life we made over 22 million tons of steel, paid Rs. 175 crores in wages and bonuses, about Rs. 45 crores in dividends, well over Rs 70 crores in taxes and Rs. 40 crores into Government's price equalisation fund. In the process we saved the country hundreds of crores' worth of foreign exchange and are doing so today at the rate of some Rs. 50 crores a year, which will rise to about Rs. 90 crores from this year onwards. I feel we have amply repaid the country for the



Molten Steel

protection granted to the Steel Industry during the difficult years following the first world war.

We have had our ups and downs and have made mistakes, but through good years and bad, we never forsook the ideals bequeathed to us by the Founder or lost sight of our duty and responsibility to the country. Tisco has provided a living and dynamic answer to the charge that free enterprise cannot "deliver the goods", is only inspired by selfish motives and does not serve the needs of the people.

In all humility, I think we can justly claim we have served the country consistently and well.

If through these many years we have overcome so many obstacles and difficulties, it is partly because even in the darkest days of our history we enjoyed the trust and the support of our staff, workers, consumers, Government and shareholders.

Last year we began the second fifty years of our existence with confidence. We are conscious of work and responsibility that faces us and of the many problems and difficulties ahead, but with the combination of an expanded and renovated plant and a strong and mature organisation, we hope to give a good account of ourselves.

Our first and most important task is to complete the expansion of our plant and reach our two million ton target as quickly as possible. Our schedule of construction was from the start an extremely tight one. Kaiser's still hope to adhere to the original schedule, but it is too early as yet to forecast the exact dates on which each of the new units will come into full production. One unavoidable consequence of having to telescope much of the programme into one year has been a greater degree of interference with existing production than previously anticipated, the effects of which on current production are being seriously felt.

In view of the magnitude and urgency of the country's needs the Planners were right in setting their sights high and attacking the problem with boldness. At the same time, the very complexity of the task, the difficulty of estimating precisely the costs of materials, equipment and services over a period of years, and the uncertainties in regard to political and economic trends throughout the world, made it all the more necessary to temper boldness with realism and to provide some margin for under-estimates, increases in costs and other contingencies. Instead, out of the original planned investment of Rs. 4,800 crores, no less than half, or Rs. 2,400 crores, was made dependent on such uncertain factors as foreign assistance, deficit finance and further taxation over and above the additional taxation of Rs. 450 crores already provided for. The estimated expenditure has since risen to Rs. 5,600 crores or more, increasing the gap to an even larger one. Faced with such a situation, I believe the Government of India recognise that substantial adjustments of the planned expenditure are inevitable.

The Plan, after all, is only a means to an end, not an end in itself, and the progress we make during the current five years is only one step in a long and steady march towards our ultimate goal. If we keep our eyes on that distant target, the exact measure of the step we take in the Second Five Year period loses some of its apparent importance. By taking a shorter and surer step today we may, in fact, reach our goal sooner and we shall certainly incur less risk on the way.

Everyone, from Government downwards, recognises the crucial importance to India of foreign capital, whether in the form of aid, loans or equity. There is today an unprecedented demand for capital funds in all countries which has resulted, even in an enormously wealthy country like the U.S.A., in an acute tightness of money. It stands to reason that with local demand competing strongly for available funds there is little inducement for foreign capital to flow to India. Our constantly rising burden of taxation and the disincentives contained in various enactments and measures hardly represent the best way to create enthusiasm abroad for investing in, or lending money to, India.

Yet there is in the advanced countries of the West realisation of the tremendous long-term possibilities of increased trade with India and of opportunities for investment. If our Government and Parliament realising the full extent of such possibilities were to revise some of their policies so as to generate greater confidence in the investment markets here and abroad, I believe that over the years a

substantial flow of foreign capital could be induced to this country and our foreign exchange position thereby greatly eased.

We were received with the utmost consideration by the distinguished President of the World Bank and other Executives of that great Institution. They were good enough to agree to increase the amount of the previous loan of 75 million dollars by an amount equal to that which we were able to raise elsewhere subject to a maximum of 17½ million dollars, which is half the remaining gap of 35 million dollars. In order to facilitate our task they went further. They agreed to raise the amount of the present mortgage up to 110 million dollars, so that other lenders in the States could rank *pari passu* with the world Bank in the matter of security, and they also agreed to the loans from such lenders. We are deeply appreciative of the consideration and assistance extended to us by the World Bank, without which the task of raising the necessary funds would have been well-nigh impossible.

I should like to take this opportunity to thank the Government of India for the assistance they have given us in this matter, both by sponsoring and guaranteeing the additional loan from the World Bank and by helping us in various ways in our negotiations with the commercial banks.

Bihar, along with adjacent areas, is rapidly becoming the industrial heart of India. It is essential that its development should follow an orderly pattern based on the maintenance of industrial peace, productivity, sound trade unionism and a high degree of discipline without which efficient production is impossible. It is gratifying that the Government of Bihar, while continuing to protect the legitimate interests of the workers and to promote their welfare, fully appreciate the importance of maintaining production and good industrial relations in their State. I am sure they will find the managements of the industries established there more than willing to co-operate with them in carrying out these objectives.

The Government of India are also deeply concerned in this matter, for the industries of Bihar are national industries serving the whole country, and progress or set-backs in their working will benefit or injure the nation as a whole. The Central Government are themselves building three large steel works and other plants in the area, and a number of important industries, such as the Chittaranjan Locomotive Works and the Sindri Fertiliser Factory, are owned and run by them. What happens in the area is therefore of vital importance to them, and we look to them, in co-operation with the State Governments concerned, to initiate or support measures calculated to maintain peace, discipline productivity and efficiency in the great industries on which the future prosperity of this country so largely depends.

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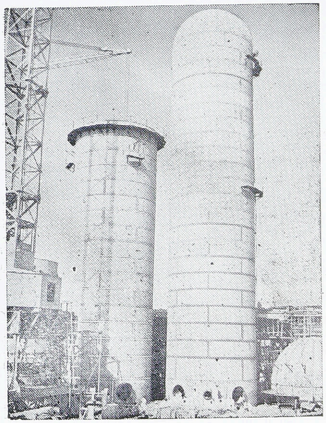

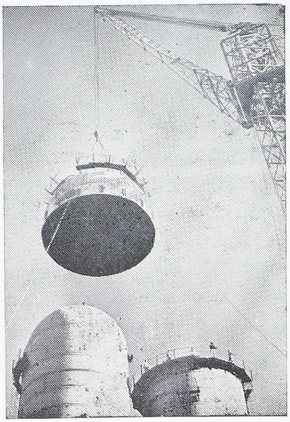

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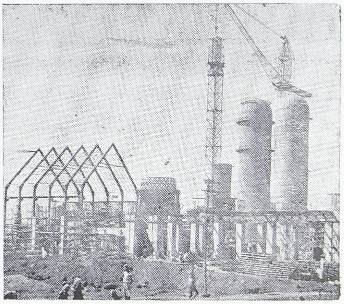
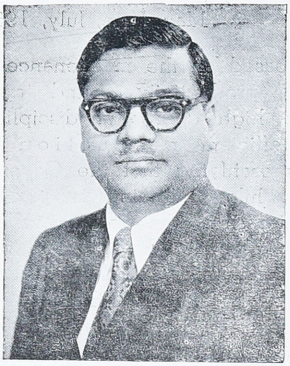




Shri Jalan here powerfully pleads for regaining some of the former glory of this great industry.

INDIAN JUTE INDUSTRY

D. N. JALAN

President, Indian Chamber of Commerce, Calcutta

Indian Jute ndustry which had been enjoying monopoly in the packaging world for several decades will have to struggle hard for its existence one day, could never be imagined till 1947 when the country was partitioned and almost all the jute growing area went to Pakistan. That was perhaps the biggest shock that the industry received during its existence; its position was changed overnight. The second shock came in 1949 when all the Sterling area countries devalued their currency with the exception of Pakistan. As a result India had to pay very high prices for imported raw jute. In that year the industry suffered a nett loss of over Rs. 1.80 crores in comparison to nett profits of about Rs. 2 to 3.5 crores per year which it had been earning for several previous years. Since after 1950 which had been a exceptionally good year in which the industry made a nett profit of Rs. 5 crores, the industry has been in dwindling state, profits have been constantly going down so much so that for the year 1955 they are estimated at less than Rs. 25 lakhs, and 1956 and 1957 are decidedly the years of loss—the nett loss for the year 1956 is estimated over Rs. 2½ crores.

The main factors responsible for this unfavourable state of affairs are, increasing steady competition from Pakistan, Japan and other countries who have installed modern jute machinery designed to save labour costs, competition with multi-wall paper bags which have come to stay in the field for small

packaging; protective high import tariffs imposed by Continental countries and the U.K. In the U.K. for instance, there is a "mark up" on the landed cost of our goods in order to bring the selling price in line of those of Dundee. This "mark up" was 40% till July 1957 when it was reduced to 30%. As a result of this policy our exports to U.K. dropped by nearly 50% in 1957 as compared to 1956.

In the U.S.A. we are facing a keen competition with paper bags, and our exports of hessian to that country fell by 5% last year. But what is more significant is, that there was a fall of about 12% in the U.S. consumption of burlap last year which was due to a reduction in manufacture of bags.

Pakistan besides having modern machinery has another big advantage in having better quality jute at cheaper price, whereas India has to obtain jute from Pakistan on higher price.

Another factor which has been telling on the Jute industry is the payment of huge sums by way of compensation, gratuities etc., to retrenched labour. Cumulative effect of all these factors has been that the industry has been running at a loss for the last two years.

The Indian industry should therefore, be said to be faced with a challenge which threatens even its existence. The solution of the difficult situation lies mainly in our attaining self-sufficiency in raw jute as early as possible and overall reduction in the cost of production of jute goods. Both the Government and the Industry have been striving hard to attain these objectives.

Production of raw jute in India has made remarkable progress since 1947, when the country was partitioned and it became clear that India, in order to run its Jute Mills, will have to obtain self-sufficiency in jute. In 1947 our production of raw jute was only about 16,60,000 bales and production of Mesta was almost nil. In 1956-57 production of Jute increased to 42,48,000 bales and of Mesta to 14,78,000 bales. We are however still much behind our target of self-sufficiency. The target of jute fixed under the Second Plan is 55,40,000 bales. No target has been fixed for Mesta fibre. According to the calculation made by the Jute Inquiry Committee the deficit in 1960-61 may well be over 400,000 bales if the targets of Jute and Mesta production are achieved according to plan, which seems to be difficult in view of estimated figures of production of Jute and Mesta for the year 1957-58 which show a fall of about 200,000 and 267,000 bales respectively over the production of 1956-57.

Our production of superior Jat variety of jute which is needed for manufacturing bright hessian, is almost nil and for that we have still to depend on Pakistan. Improvement in the quality of fibre depends amongst other things on the availability of abundant slow-flowing water for retting purpose. Taking this in view the Jute Enquiry Committee has recommended centres where improved quality jute can be produced. There are areas in Lower Assam Valley, Northern Districts of West Bengal, Sirpur and Kishenganj of Bihar where jute of better quality can be produced. Besides these there may be possibility of producing better quality jute at places where canal water from Projects such as Damodar and Mayurakshi, can be made available for retting purpose. It has been noted that the jute cultivation has improved in quality as well as in yield per acre where it has been cultivated by the experienced jute cultivators who arrived from Pakistan. Efforts should therefore, be made to settle these people in these areas.

With production of better quality jute attention should also be paid to increase yield per acre. Our yield per acre is much below than that of Pakistan. It is only about 2.4 bales per acre against about 3.4 bales per acre produced in Pakistan. In fact availability of cheap and better quality of jute has naturally been advantageous for the industry in Pakistan.

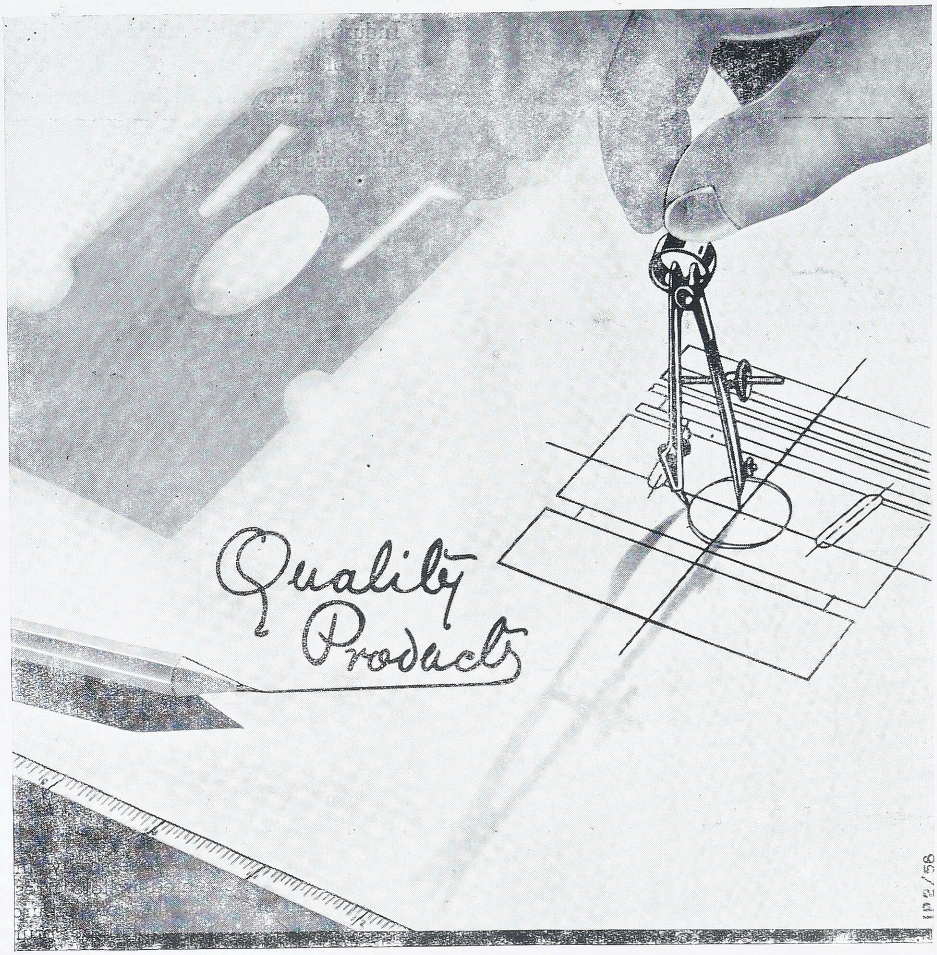
Another big question before the industry has been of replacement of its machinery which

has been worn-out due to over working during the war period. The industry has made good progress in this direction. Quite large sums have been spent on modernisation of mills. Up to the end of December, 1957, forty-three Mill Companies had been able to equip with modern Spinning Machinery. The actual number of spindles installed up to December 1957 is about 1,80,000. These Mills with new spindles are working in double and triple shifts. Therefore, the availability of spindles has largely increased as compared to the number of spindles actually installed. When figures of spindles thus arrived at are compared to the total figures of old spindles, attainment of modernisation may be estimated at about 55% up to the end of December 1957. It is expected that the remainig programme will be completed in the next few years.

Linked with the question of modernisation is the question of rationalisation. In fact the losses that some of the modernised units suffered during the past years were mainly due to the payment of retrenchment compensation rather than actual loss in the working. "Rationalisation without retrenchment" is the demand. While at one hand the Government is assisting the industry in its modernisation plans by way of loans, it is unfortunate that on the other hand it is against retrenchment of labour force. One of the important purposes of modernisation is reduction in labour costs. In this connection the Jute Enquiry Commission have said: "Reduction in labour costs is also equally essential to make jute goods cheap enough to gain further ground in the market from substitutes which have secured a foothold .... In this context, modernisation of equipment becomes as essential as longer working hours." They have further said: "The problem of rationalisation naturally raises the human problem of how best to achieve rationalisation without a sudden displacement of labour. Since the industry is localised in Calcutta, this problem has special significance for West Bengal. Responsible opinion in West Bengal agreed with the view that the future of the industry lay in improving the quality and output of the jute and in the rationalisation of the industry. Rationalisation might temporarily cause unemployment but it is the lesser evil compared to permanent damage to the industry and labour and to the growers who depend on it if the industry should be allowed to perish."

But in spite of all this the resistance to rationalisation still continues so much so that the West Bengal Government have found it necessary to constitute a Tripartite Committee to consider the whole matter. In fact the wage costs in the industry do not give incentive for investment in modernisation and if the question of rationalisation and retrenchment is not properly tackled, many mills will have to reconsider their programmes for modernisation.

Given a proper approach to the various problems the numerous difficulties can be easily got over. It is true that the Second Plan does not envisage any significant expansion of the industry's capacity. This, however, does not suggest that the industry will not be playing its important role in the development of the economy. The export of jute manufactures will continue to fetch large sums in foreign exchange while an increasing internal demand will be satisfied. My optimism regarding the better future for the industry is based on its highly organised state and great tradition for active co-operation and consultation. With the sympathetic understanding of the problems by the Central and State Governments it is only to be expected that this important industry will be able to regain some of its former glory and that the investors will not have any reason for great complaint.



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FIVE YEAR PLAN

G. D. BIRLA

Chairman, The United Commercial Bank Ltd., Calcutta

The year 1957 saw a long tussle with inflation; as a result, many countries are trying to change into reverse gear, but the process will be difficult. All of a sudden the bogey of inflation has yielded place to the reality of recession. While a world-wide cheap money policy may not be feasible, it is at the same time true that we seem to have reached a stage where we may be exaggerating the effect of inflation in present-day conditions.

The yield on industrial securities rose from 5.75 per cent (tax free) at the beginning of the year to 7.26 per cent (tax free) at the end of the year and this factor also contributed to the difficulty of existing companies in procurement of fresh capital by way of debentures or preference shares at reasonable rates. The Industrial Delegation which visited the United States and Europe has pointed out that the limiting factor in getting credit from abroad is not so much the reluctance on the part of foreign institutions and suppliers to give credit as the difficulty of raising internal capital in India itself. It is really the quantum of Rupee capital available in India which would appear to determine the finance that could be obtained from abroad.

Second Five-Year Plan

There are those who vehemently insist that the plan be implemented in toto irrespective of the cost or availability of resources, while others urge that the plan be pruned or rephased without stating how or to what extent the re-planning should be done. People are apt to forget that the plan is not an end in itself but only a pointer to certain objectives, *viz.*, greater production, fairer distribution and increased employment. Although the Plan envisages a total outlay of Rs. 7,200 crores, it has, in subsequent estimates, been still further increased to allow for increased costs and additions to projects. But, sticking to the original estimate of expenditure in the public sector, the main provisions are Rs. 2,300 crores for transport, communications, power and irrigation; Rs. 340 crores for agriculture and Rs. 690 crores for industry and mining in the

public sector (total Rs. 3,330 crores) and Rs. 700 crores for industry, mining and plantations in the private sector. The projects covered by these allotments constitute the core of the plan, the rest of the plan expenditure being for community projects, social services and the like. The public sector is faced with difficulties in the target limit as well as in achieving the production and employment targets. On the other hand, it would appear that the private sector is almost certain to complete its assigned task and invest its full quota of earmarked resources well before the end of the plan period.

Industrial Production

The index of industrial production has risen from 100 in 1951 to 168.5 in June 1957. Privately owned collieries are already producing coal at an annual rate of 40 million tons as against a target of 48 million tons in 1961. Textile mills were briskly moving towards the plan target of 8,500 million yards, but there is not enough cotton available to enable this quantity of cotton textiles to be manufactured, and as both internal consumption and exports have dwindled, the plan target will have to be lowered. Expansion of manufacturing capacity in cement is lagging behind on account of foreign exchange shortage, but enough progress has already been achieved to make the supply position turn easy. Steel is an easy winner. Owing, however, to factors, all too familiar, of shortage of foreign exchange and lack of internal capital, the tempo of industrial expansion is slowing down and the goal of 8 million new jobs is receding. It therefore behoves the Government to reappraise the situation and initiate policies calcuated to reactivate the industrial sector and to increase the foreign exchange earnings on our export trade.

Agriculture and Industry

The weakest feature of the Second Five-Year Plan is the imbalance between agriculture and industry. Agriculture occupies a key position in our economy. At the end of the Second Plan period our total national income is expected to rise to Rs. 3,500 crores of which nearly 46 per cent is expected to come from agriculture. If agricultural production is not increased substantially, the purchasing power of the countryside will, in relation to industrial production, be reduced and the latter will ultimately have to go down. Increased food production would abolish scarcity conditions with attendant wholesome effect of the psychology of the masses and creation of condi-

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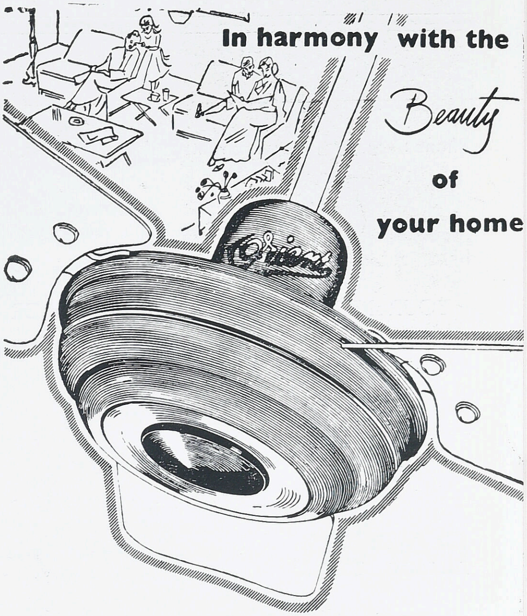

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tions favourable to higher production. This should be emphasised from another angle also for, it is difficult to contemplate with equanimity, in view of the deteriorated foreign exchange situation, continued imports of between two and three million tons of foodgrains a year for as far ahead as we could visualise. While production of grains in absolute figures is not declining, the increase in output is not commensurate with the addition to population. But unfortunately, the cut in fertilizer imports is likely to reduce agricultural production still further. We cannot afford to build steel mills at the risk of jeopardising food supplies. The least that should be done is to erect more fertilizer factories at the same time as steel mills.

Increased production of cash crops could also alleviate our foreign exchange position. An additional one million bales each of jute and cotton per annum would mean an annual gain of almost Rs. 55 crores in foreign exchange. Our production of oilseeds and the yield of oilseeds per acre have remained static and a 25 per cent rise in the output of oilseeds would enable us steadily to export to foreign markets vegetable oil which is so much in demand. We were successful last year in exporting about 160,000 tons of sugar earning valuable foreign exchange. I would go to the length of suggesting that exports of sugar and other commodities in international demand should be encouraged even at the risk of such commodities becoming somewhat scarce in the country or of subsidising such exports.

I welcome the recent announcement by the Government of India of certain fiscal reliefs by way of the repeal of the compulsory deposit of the reserves and the reductions in excise duties on various qualities of cotton textiles. If this is indicative of the willingness on the part of the Government to study each situation dispassionately and not merely from the point of view of revenue, we may look forward to revisions being announced and implemented by Government at timely junctures.

Mr. Morarji Desai had held charge of the Ministry of Commerce and Industry with great distinction and he brought to his new and onerous task a reputation as an extremely able and efficient administrator. I am sure that finance is in the hands of one who will safely steer this important portfolio through the remaining difficult years of the Second Plan period.

* * *

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ON THE FACTS

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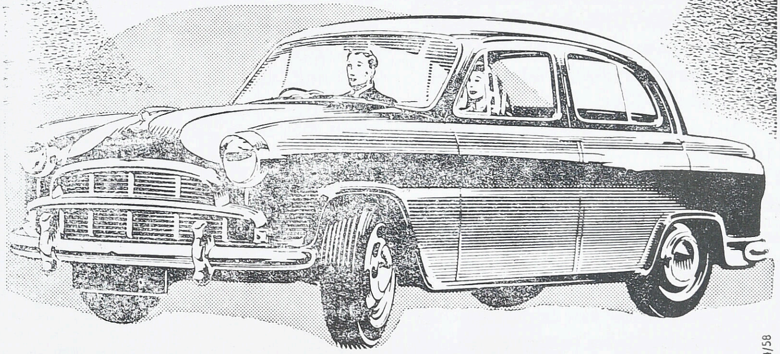

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PRODUCTIVITY

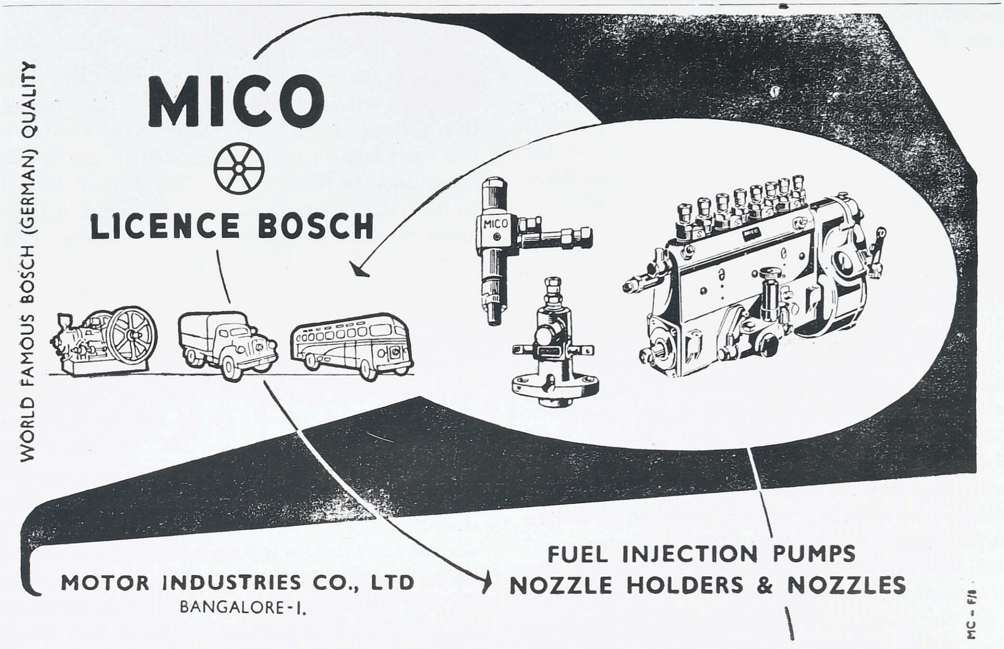
K. C. MAHINDRA

Chairman, Indian Aluminium Co. Ltd., Calcutta

Over the last twelve months the strains on Indian economy have been severe and unprecedented. There has been rapid depletion of sterling balances; exports have barely maintained their level and savings have dried up. Import restrictions became inevitable; even the supply of key industrial raw materials has been affected. All these total up to a severe lack in available resources.

I do not propose to enter into a detailed argument on the merits or otherwise of planning. The past is a bucket of ashes. What should be recognised is that to stand still will be to stagnate. It is also to be recognised that the most prominent feature of Indian economy in the last 12 months has been the pulling up of socks in the most classic orthodox manner—inflationary prices, particularly in food-grains, have been halted, bank advances and credits controlled and directed into worthier channels, and even tax adjustments, although minor, admitted into the new pattern. Despite the pedestrian budget, the keel of the ship of the realm has been righted and set on a straight, although austere course. I do not decry controversy and argument over past mistakes, but, quoting the British Prime Minister, why look up a train in last year's Bradshaw? The need of the moment is to find equilibrium in motion. " History does not linger long in the 20th Century; the world alters as we walk in it." (Oppenheimer).

All of us recognise now that food and soil productivity is our problem Number One, and that increasing returns per man-hour in the field and per acre of the arable soil are the



only stable bases for advancement of the economy in India. It is to be regretted therefore that policies bearing on agriculture do not show any significant appreciation of the issues involved. Means must be found to enlist the co-operation and the enthusiasm of the non-agricultural sector. It has to be both an individual and State effort. At Government levels general policies and plans will continue to be evolved; I suggest that at the local and regional level individuals should get mixed up actively in this programme. This is easier said than done. It is perhaps a most difficult thing for a lawyer, an accountant, an industrial executive or a shop assistant to become enthused over how better food can be grown, what helps soil conservation, why water is needed in regulated measures and when. Yet in my opinion, it is most important that at this stage of our fight for economic survival the ordinary non-farming citizen from the city, the town or the village should not only know these things, but know how to help advance knowledge and modern practice in these matters.

I make an unusual suggestion: There are a little over half-a-million people in the country who pay income tax. Over 80 per cent of them are undoubtedly of the small-tax class—only a small percentage bear the bulk of the burden. My suggestion is that each tax-payer should be permitted to "invest" 10 per cent of his tax amounts in soil improvement and soil productivity in the locality of his choice and in the manner he wishes, save that the contributions can not be used for lending purposes. Bulk of the small tax-payers may be given the option to contribute their tithe to the local co-operative of their choice, as long as the co-operative does not engage in purely credit operations. Those who pay a

significant amount in taxes, individuals and corporations, may choose to select a village area or a block of villages for such "investment". The main thought behind the suggestion is that the non-agricultural sector in responsible positions should develop knowledge and interest and enthusiasm for land improvements. Government assistance at State and local levels should be willingly forthcoming for any measure or programme so suggested by the individual tax-payers for the selected area. Questions of control and of possible abuses in the spending of this ten per cent of tax-money are no doubt vital to the success of the scheme. The Central Board of Revenue have enough ingenuity of mind to devise checks and cross-checks for the purpose. The Community Development projects have developed a basic cadre of trained workers and evolved an organisation which can be utilised for checking on the veracity of individual expenditures. The Central Government will lose 10% of the income-tax collections, but the positive gain in the enlistment of individual zeal for matters agricultural will be immense. The ten per cent reduction in tax collections is not lost, if it is being diverted to a sector of the economy where responsibility has to become collectively universal; "invested" in what may be called unit programmes of enthusiasm, leading to fruitful abundance of the soil—every new blade of corn will amply repay the tax money spent on growing it.

But no one can doubt, nor would it be proper to deny, that high vision and endeavour has been behind these planned efforts and that the various disquieting features which have emerged have really been thrown up by the hurry and the flurry to get somewhere fastest so that the average citizen can feed a little more, clothe a little better and have a roof over his shack. These are the tribulations of economic growth, exceedingly painful but nevertheless necessary and therefore inevitable. If, therefore, there has been a fault, it is one of overzeal, of failure to recognise or appraise correctly the inexorable law of economic growth in a democratic set up and in its consequences, the very rigidities of processes involved. These are grave problems worthy of serious, prolonged and continuous study by the administrators, the learned hierarchy of economists and the industrialists. There should be no quarrel with the ultimate of true socialism. To the humanity that inhabits India, socialism should have the meaning that none shall starve and none shall beg; in the meaning that human dignity shall remain and human rights shall prevail; and, finally, in the meaning that to the riches of the earth, whether of human endeavour or of economic growth, all shall inherit.

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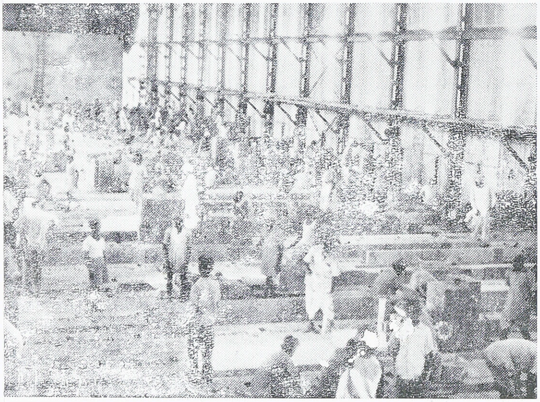

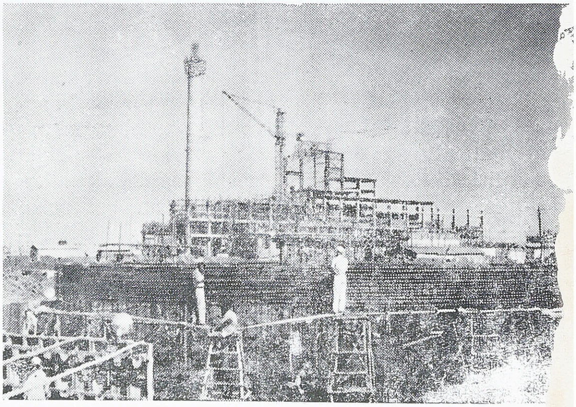

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ASSOCIATED CEMENT COMPANIES

DHARAMSEY M. KHATAU

Chairman, A. C. C.

The year under review had been one of mixed fortune: of distinct achievement, yet of poor reward. Though the Company produced and sold 2.5 lakh tons more cement than in the previous year, paradoxically enough, there had been a slump in the Company's profits, owing to a sharp rise in the manufacturing costs due to factors outside the Company's control such as higher cost of coal, enhanced railway freights and terminal charges, higher cost of stores and spares, etc. Other adverse factors were a higher wage-bill and an increased charge for depreciation. Further, the heavy incidence of taxation, resulting from the increase in the rates of Income-tax and Corporation Tax, and the imposition of the Wealth Tax had left very much lower profits to the Company.

The Industry could not continue to operate and expand under those conditions and Government had therefore directed the Tariff Commission to examine the cost of production of cement and determine anew a fair price to be paid to cement manufacturers. The ACC had placed its case fully before the Commission for an increase in price, and hope that Government would sanction such an enhanced price as would cover the rising costs of production and also enable it both to plough back a reasonable portion of profits for rehabilitation and modernisation and also to finance its expansion programme under the Second Five-Year Plan.

The various expansion projects that the ACC had in hand have made satisfactory progress. The extensions planned at the Kistna Cement Works had been completed but the additional capacity could not be fully utilized during the year owing to transport difficulties in respect of raw materials. The extension work at Sind and Chaibasa had also made good progress. A flotation plant is to be

F 4

installed at Chaibasa to enable the use of low-grade limestone. The extensions at Kymore and Shahabad are also well under way.

The ACC's new factory at Mancherial which is to use the dry process of manufacture will begin production in Sept. 1958. The Mancherial Plant would be duplicated in preference to the immediate construction of a new factory at Porbandar, which would be taken in hand again, later.

The Katni Firebricks Factory, working at full capacity, not only met all the requirements of the ACC but was in a position to sell some 7,000 tons of refractories to steel plants, other cement concerns and to any industrial undertaking using heat-resistant firebricks.

The ACC's white cement—produced at Porbandar and marketed under the trade name of '*Silvicrete*'—is becoming increasingly popular.

Raisings from the Company's two collieries at Nowrozabad and Kotma have been fairly satisfactory and certain new schemes to increase their output have been sanctioned.

The building, equipping and staffing of the Company's Technical Training Institute at Kymore was completed during the year and the first batch of 75 apprentices is now undergoing training. Intended primarily for the sons and relatives of the Company's employees, the Institute offers the best available training in India for our purpose, and most of the trained technicians will in due course form part of the specially trained skilled personnel of our cement Works. The curriculum also aims at turning out good citizens and I think the Company may well regard the Institute with justifiable pride.

The Company's requirements of working capital have increased appreciably, and would increase still further in the next few years with the increasing tempo of production. The funds that the Company had already raised whether from internal resources or by borrowing or by offering large issue of equity capital, were totally inadequate for the purpose.

The Company's Board has, therefore decided subject to the sanction of the Controller of Capital Issues, to make a further issue of Debentures of Rs. 5 crores on suitable terms and at the proper time during the course of this year. The proceeds of this issue will, however, be utilised partly for our investment in the Heavy Engineering Project which we may set up in collaboration with Messrs. Vickers Ltd. and Babcock & Wilcox Ltd., to which I made reference last year, and partly for our substantially increased Working Capital requirements in the context of our steadily increasing production. A part of the proceeds may also be used for our immediate needs of the expansion programme.

Even so, the funds at our disposal including the proceeds of the proposed Debenture Issue and the further internal resources which will accrue over the next few years, will still remain insufficient to meet the heavy capital outlay implicit in our major expansion efforts. The Company has, therefore, represented to the Tariff Commission the urgent need for the grant of an adequate Expansion Allowance in addition to a Rehabilitation Allowance in the new price of cement to be fixed in the near future. I earnestly trust that this request will meet a sympathetic if not a generous response, both from the Tariff Commission and from Government, because it is quite plain that without such an Allowance we shall be compelled to abandon many of the expansion plans and projects we have in view, for the simple reason that no further funds would be available from internal or external sources to finance them.

A good deal of capital had been locked up in the form of large quantities of equipment and stores including steel. The liquidation of these was receiving priority attention and an 'austerity' drive had been launched not only to abandon, postpone or prune the purchase of stores, but also to minimize all other forms of expenditure.

The Company's two factories in Pakistan are operating satisfactorily, but the return earned by the Company in Pakistan is very poor. The prices of coal, stores and other materials have sharply risen in the country, and the price increase sanctioned by the Pakistan Government in response to the Company's representation was altogether inadequate. In view of further increases in the cost of coal and other essential materials, the Company had again represented its case to the Pakistan Government. The total incidence of Income-Tax, Corporation Tax and Business Protits Tax in that country had risen from 56.25 per cent to 62.50 per cent.

You will be glad to know that the improvement in our relations with our employees to

which I referred with some satisfaction last year has been maintained during the year under review. Once again there were no strikes or stoppages of work to tranish our record of round-the-clock production—a matter so vital for keeping down costs and for the fulfilment of the targets set under the Second Five-Year Plan. This is a sure index of growing goodwill and mutual trust, and augurs well for our future.

It was this atmosphere of harmonious industrial relations that encouraged us to initiate talks with our workers' representatives with a view to reaching, if possible, a long-term agreement on an all-Works basis. In the course of these negotiations it came to be appreciated, however, that one overall agreement, covering the variety of conditions at all our Works, was difficult to achieve and that the purpose in view would perhaps be best served by negotiating individual unit-wise settlements.

It gives me great pleasure to be able to report that after patient negotiations, we have now reached such three-year agreements with our Workers' Unions at six of our factories.

The agreements include such important matters as wage-grades, dearness allowance, house-rent allowance and leave facilities. Negotiations at some of the other Works are still in progress, and I hope the day is not too distant when relations between labour and management at all A.C.C. Works will be regulated by similar settlements.

To my mind the signing of these six settlements is one of the most significant events within the A.C.C., because the spirit which has brought forth these agreements should certainly lead to better industrial relations in the coming years and consequently to greater prosperity for the Company and, in the same measure, for those who work in it.

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TIC 230(a)

Mr. T. Leslie Martin

MARTIN BURN LIMITED

Among the commercial establishments which struck roots in the country during the last quarter of the 18th century and are still operating, more than ordinary interest attaches to the old-established firm of Burn & Co ,—a name that may truly be said to have become synonymous with India's industrial renaissance in the 19th and the early part of the 20th centuries. The genesis of this firm goes back to 1790 (to 1774, by another tradition) when a Col. Swinton, retiring from the Indian Army, set up a small building and contracting business in Calcutta. Leaving India in 1793, Col. Swinton left his business to James Rolt, his foreman. Business expanding rapidly, Rolt took in an assisstant, Alexander Burn, who gave his name to the Company. It was however, John Gray who, by dint of his great energy and shrewd business acumen, put the affairs of the Company on a sound footing. It was during his stewardship that the Company first interested itself in civil and mechanical engineering.

The Company went from strength to strength during the subsequent decades.

On the 31st December, 1894, the assets of Burn & Co. were transferred to a joint stock enterprise and the new company—styled Burn & Co. Ltd.—came into existence the next day.

In 1850 there arrived in Calcutta, Mr. Acquin Martin (later Sir Acquin Martin), then a young man of 24, to open a branch of Messrs. Walsh Lovatt & Co., a firm of general merchants based on London and Birmingham. He started securing contracts and building aqueducts, water-works and drainage schemes all over the country. This new activity, however, did not appeal to Lovatt's and they retired from India.

aiding India's progress

Sir Biren Mookerjee

It was some time before this that Sir Acquin became associated with Mr. Rajendra Nath Mookerjee (later Sir Rajendra) who had already earned a great reputation for the various water-works schemes which he carried out most efficiently on behalf of another firm. This association between two kindred spirits—momentous as it appears in the present context of things—resulted in the formation in Calcutta in 1892 of the firm of Martin & Co., a name which was later destined to become a household word throughout the length and breadth of this sub-continent.

From the outset, the partners of the new Company pursued a policy of developing the vast resources within the country particularly in relation to engineering in all its branches. They built the first feeder railways in India, and secured the agency of the Bengal Iron Company (which was later acquired by The Indian Iron & Steel Co. Ltd). The turn of the century saw Martin & Co. busy with the flotation and development of docks, collieries, engineering works, manganese mines, tea, timber and electricity supply companies. At one time every major waterworks scheme in India between Calcutta and Peshawar had either been built or equipped by Martin & Co.

Sir Acquin Martin finally retired from India in 1905. Upon his death in the following year, Sir Rajendra became the senior partner of the Company. One of the pioneers of modern India's industrial renaissance, Sir Rajendra realised that the country's prosperity lay only in progressive and peaceful industrialisation. On Sir Rajendra's death in 1936, an event widely mourned in this country and abroad, the mantle and the proud heritage painstakingly built up by the first partners of the Company fell upon their sons, Mr. T. Leslie

Martin and Sir Biren Mookerjee. Both have steadfastly followed the path struck by their predecessors

The greatest single achievement of Martin & Co. was their acquisition in February 1927 of the old firm of Burn & Co. These two firms were integrated in 1946 into a new public limited company under the style of Martin Burn Ltd. which took over the management of the various undertakings and agencies held separately by the two partnership firms.

Martin Burn Ltd., with all its ramifications in different spheres, today ranks as the premier engineering combine in the country and opportunity is now taken to furnish brief accounts of the activities of the more important components of this Organisation.

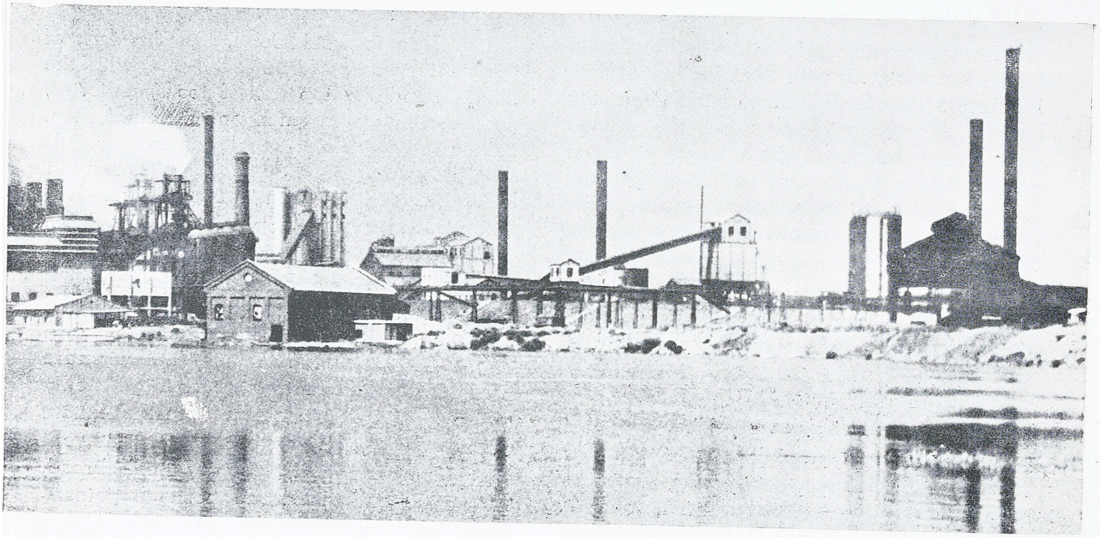
The Indian Iron & Steel Co. Ltd.

This Company was launched in 1918 under the managing agency of Burn & Co. Since 1946 it has been under the managing agency of Martin Burn Ltd., when the old firm of Burn & Co. was dissolved. The Company has two works, one at Burnpur and the other at Kulti and rich iron ore deposits at Gua and Manoharpur. The Iron Section of the Burnpur Works consists of two blast furnaces, coke plant with bye-products plants to recover gas, coaltar, sulphate of ammonia and benzol. Practically all the iron produced in this Section is used for the production of steel ingots in the Steel Section of the Works.

In the Steel Section there are four open hearth furnaces; a Bessemer Converter shop; a 40" Blooming mill; a sheet, bar and billet mill; 34" and 18" Section mills; and a sheet mill. Products of these works include blooms, bars, billets, rails, beams, channels, angles, hoe bars and black and galvanized sheets.

The Kulti Works is the oldest unit in India for the manufacture of pig iron by modern methods. The Kulti plant comprises two blast furnaces, coke ovens, and bye-products plants. There is also a large iron foundry at the works and its Spun Pipe plant is the only one of its kind in India.

With the extensions now under way, the production of saleable steel manufactured at the IISCO Works will be upgraded to 800,000 tons and of foundry pig iron to 280,000 tons per annum. The consequential increase in the Company's requirements of electric power will be met by the installation of an additional 20,000 KW generating plant.



A Panoramic View of

Burn & Co. Ltd., Howrah Iron Works

The Howrah Iron Works stand on 47 acres of land alongside the Hooghly and comprise six main divisions, *viz*, railway wagons, heavy structural steelwork, mechanical work, points, crossings and permanent way fittings, iron and steel castings, and cast iron railway sleepers. These works have always maintained a close collaboration with the Indian Railways and supplies made over the past years include 25,000 wagons, 10,000 sets of crossings and switches and over half a million cast iron sleepers. The present monthly capacity of the wagon, structural and welding shops of the Works is in the order of 1000 tons of structural steelwork and 400 sets of crossings and switches. The completely re-equipped and modernised foundries at the Howrah Works can now manufacture iron castings up to 20 tons and the production capacity of the six cupolas is over 14 tons. The steel foundry is equipped with a 5-ton Siemens basic open-hearth furnace. The gear cutting plant at the Howrah Works is the largest in the East.

The Indian Standard Wagon Co. Ltd., Santa Works

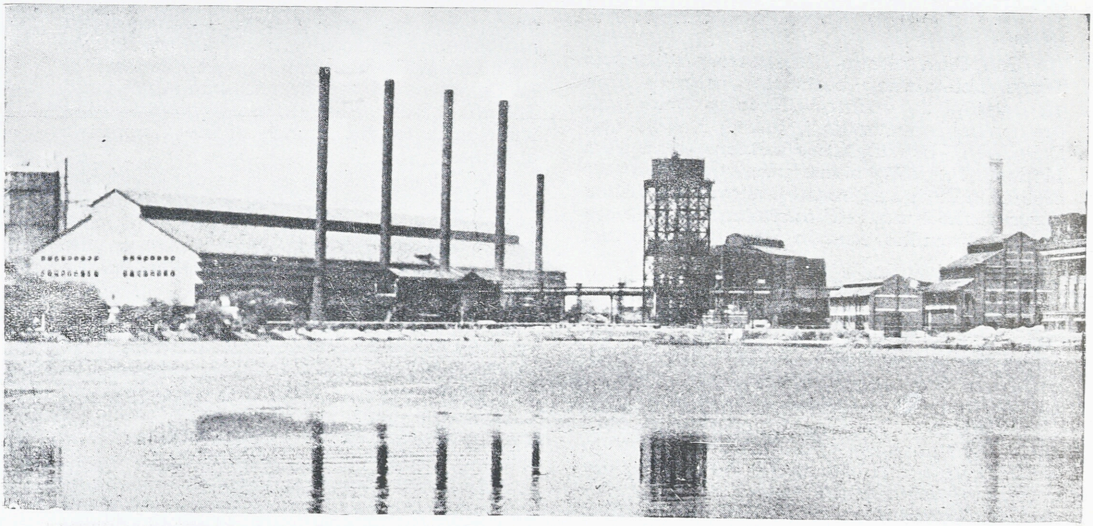
Floated in 1919, this Company, which operates in close collaboration with both the Burnpur and the Howrah Works, devotes itself exclusively to the manufacture of railway rolling stock of all types and sizes, and their components.

The Santa Works are now engaged in manufacturing various special type wagons for the Railway Board, Government of India, including 'BOBS' type wagons—the largest to be built in India—for movement of iron ore from mines to the steel works.

The Hooghly Docking & Engineering Co. Ltd.

This Company was launched in 1819 and is one of the oldest of its kind in the East. Apart from repairing of ships, the Company is fully equipped to design and produce all kinds of river, harbour and coastal craft such as tugs, launches, motor boats, barges, buoys etc. The Company also undertakes repair and construction of marine boilers and have recently gone into production of marine engines, which is the first venture of its kind in India. The Company's Works at Salkhia are equipped to handle all manner of allied engineering jobs and also to construct jetties and locks.

The Company has extensive and well-equipped workshops and a shipbuilding yard



The Indian Iron and Steel Co. Ltd.'s Works, Burnpur

at Salkhia opposite Calcutta. Its dry dock, known as "Hooghly Dock", is now the only privately-owned dry dock at Calcutta capable of taking ships of deep draught. Vessels which cannot come up to the Works site at Salkhia owing to the construction of the new Howrah Bridge are dry-docked for repairs etc. in one or the other of the Calcutta Port Commissioners' docks at Kidderpore further down the river.

Burn & Co. Ltd.—Refractory & Ceramic Group

The roots of these works go back to 1870 when Burn & Co. Ltd. acquired the works of Raniganj Pottery Co. Ltd., established ten years earlier by a civil engineer named George Macdonald who, while conducting a survey in the district on behalf of the East Indian Railway, accidentally located a rich deposit of clay highly suitable for pottery products. Burn & Co. made considerable extensions to Macdonald's works by acquiring adjacent lands and properties and thereby laid the foundations of what are now the largest refactory and ceramic works in the whole of India.

Refractory materials have assumed increasing importance in view of the rapid industrialisation in the country over the last 30 years or so. They are specially important to the iron and steel works for the building and lining of furnaces and of coke ovens for the production of iron, steel, other metallurgical furnaces and glass.

The Burn Group of Refractory & Ceramic Works obtain their basic raw materials from all parts of the country. Fireclay comes from the coalfields of Raniganj, Jharia, Bokaro and Daltonganj, bauxite for aluminous bricks from Madhya Pradesh, silica from the Monghyr district in Bihar and magnesite from far distant Salem in the South. Chromite and kyanite are obtained from the ore-rich Singhbhum district of Bihar.

Robert Hudson (India) Private Ltd.

Incorporated in 1917, this Company has become synonymous with all manner of light railway work and "Hudson's railway material" are the natural choice whenever and wherever a light railway is proposed to be laid and equipped in India. The Company's modern and fully-equipped works at Kidderpore in Calcutta are entirely devoted to the manufacture of light railway material. This Company manufactures tipping wagons, tipplers and coal tubs for collieries, timber bogies for forest departments, sugarcane cars and platform trucks, track materials, wheels and axles and fittings, sleepers, turntables etc. Among the Company's achievements in the past mention may be made of the construction of the Nepal Government Railway and supply of light railway material to almost all the major engineering and irrigation projects in pre-partition Punjab and Sind.

In recent times, this Company has figured prominently in almost every national and State project of importance in the country.

Feeder Railways

The first partners of Martin & Co. early visualised that in a country of vast distances as India on the brink of an industrial renaissance, transport would be a major problem and the only answer to this problem was to provide short narrow gauge systems. Martin & Co., were the pioneers in this field and of the nine light railways constructed by them in various parts of India, they now run six, comprising a total of over 300 route miles.

Electricity Supply Companies

The Martin Burn Organisation now operates ten separate electricity supply companies and undertakings in different parts of U.P. and M.P.

Building and Architectural Department

Martin's building activity is spread all over India and as far afield as Aden with Government buildings and offices, colleges and Universities, clubs, churches and temples, memorials and mausoleums, palaces and private residences too numerous to mention. The Victoria Memorial in Calcutta and the Ramakrishna Mission and Temple at Belur, Howrah, are two outstanding testimonies to this branch of the Company's activities.

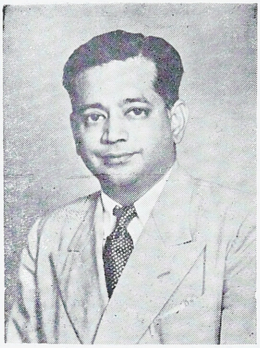
In Calcutta itself there is hardly any public building of importance that was not designed and built by this Company. Among the more recent achievements in this sphere is the 13-storeyed new Secretariat Building of the West Bengal Government.

Agencies and Stores Departments

The Agencies Department handle a large volume of business in miscellaneous items such as rubber chemicals, roofing and rust-proofing compounds, hard and soft boards, cranes of various types, fork trucks and tractors, diesel engines, etc

Extensive stores and metal yards with railway siding facilities are located in Calcutta and Burnpur to take care of speedy delivery of orders.

* * *



Possessing the texture, smoothness and beauty of silk, Rayon brings within the common man's reach cloth of uncommon beauty and strength.

RAYON INDUSTRY

A. R. Ramanathan

Chairman, The Travancore Rayons Limited.

Making of rayon or artificial silk has been a dream of many a scientist, but it was only in the year 1884 that it was finally achieved by Count Hilaire de Chardonet, a pupil of Pasteur. Basing his work on previous research and after 30 years of great effort, he took his first patent for making collodin, nitro or Chardonet silk in 1884—85. Chardonet was mostly associated with acetate yarn and it was around 1892 Cross and Bevan developed what is popularly known as Viscose Rayon Yarn. The basic raw material for rayon is cellulose—the solid material of the cell walls in plant life. This cellulose is first dissolved or dispersed in liquid and then regenerated back into solid state in the form of filaments through minute platium spinneretts. These continuous filaments vary in thickness, and are woven into textile fabrics.

Since World war II, rayon, a relatively new entrant to the textile world has assumed an outstanding position, second only to that of cotton. The rayon industry in this country is one of the major post-war industries. Although substantial quantities of art silk fabrics were being manufactured in this country, for quite some time, the necessary yarn required were imported from foreign countries. The weaving industry was thus entirely dependent for the raw material from outside sources with consequent uncertainties of supply. Thus, immediately after World War II, much attention was focussed on production of the much needed fibre in this country. That was the year 1950, when the first factory for producing this synthetic fibre was started in Travancore.

From 1950, by systematic development of the industry, to-day, India is able to produce about 20 million pounds of rayon yarn per year, in the popular variety of 150 and 120 deniers. The estimated demand of this country is set at 68 million pounds per year, which was the target fixed by the Planning Commission for the Second Five-Year Plan.

The estimated production of 576 million yards, both from power-looms and handlooms per year, could easily be consumed in this

country. With this production of 576 million yards, which means, our *per capita* consumption is about 1.5 yards per year, per person, assuming a population of 400 million. India can easily stand world competition in the international market with the quality of the yarn she produces and earn for herself the much needed foreign exchange which we are short to-day.

The latest development which has been achieved both in the U. S. A. and Europe, in what is known as "spun dyed" or "dope dyed" rayon yarn. The development has revolutionised the use of rayon yarn in the U. S. A. and U. K. and this has also been successfully manufactured in the factories in India and the spun dyed yarn should be available for the weaving industry before long.

The supply position of yarn remains very satisfactory and the prices have been maintaining a steady level. This should not be attributed to any excessive production or imports, but it may be partly due to the balanced way in which the rayon has been distributed and also partly due to the financial stringency which has prevented the the market from going high in spite of temporary shortage. In addition, various associations in this country have been making bulk purchases of rayon yarn from other countries which will go a long way in maintaining a steady flow of raw material and at the same time maintaining a balanced price.

Like all other countries, India also is fixing up standards for the manufacture of rayon yarn and has set up a Standards Committee. By the rayon industries manufacturing yarn according to the strict limitations fixed by the Standards Committee, the ultimate user, that is, the weaving industry will be able to produce fabrics second to none and thereby maintain the quality set up by the International Standards.

At the moment rayon weaving industry in India is not very well organised and in view of a good many small units being uneconomical in operation, it would be advisable for these small units to come under the aegis of a co-operative society. It may be possible for the proprietors of these small units to get the advice of experts for technical assistance and employ economical purchasing and selling arrangements. For some years past, though the capacity of the industry was large, yet in view of comparatively poorer quality of fabrics, the demand was not what it should be. But with the fixing up of the standards for rayon yarn, in applying the latest technique in the weaving industry, the Indian rayon manufacturers should in the coming years produce as fine a quality as compared to the other countries. It is hardly necessary to mention that the progress of the rayon spinning industry largely depends upon the development of the weaving industry to keep pace not only with the advance of science, but also with the advances made by weaving techniques of other countries The progress made by the weaving industry for research has been quite encouraging and within a short time, when the difficulties are overcome, the future of rayon in this country will be bright.

The use of rayon is varied in Europe and U. S. A. and it has been developed so high that two-thirds of the dresses worn by American women are made wholly or partly from rayon yarn. Rayon is the back-bone of the great American ready-to-wear industry —dresses, underwear, hosiery, linings, and numerous other items of women's and children's clothing. In combination with wool and cotton, rayon staple has brought into being whole ranges of new woollen and worsted type fabrics; flannels, blankets, etc. To modern homes, rayon has brought excellent home furnishing material to meet a variety of tastes and needs. In India, the uses are different. Rayon is used for sarees, blouse pieces, ribbons, silk threads, and underwears, etc. The variety of colours and shades and the popular designs with which the weavers have been able to produce the inexpensive rayon have attracted the attention of the majority of the women in this country for their clothing needs, with the result they are able to clothe themselves having the satisfaction of the luxury of silk but not as expensive. With the high prices of pure silk, rayon is able to come as a very welcome substitute for people who would like to clothe themselves with the change of fashion every day, but at the same same time spending perhaps about one-fourth or one-fifth of the price of natural silk.

Rayon being water absorbent is more suited for clothing in tropical countries like ours, when compared to nylon and other synthetic fibres which are water repellent. The rayon industry in India has played a very commendable role in increasing the economy of our country.

* * *

Krishna's daughter is going to College

Krishna is a happy father these days. His daughter, Saroja, is the first girl in his family to attend a college. And she can mix freely with the children of the wealthiest, because her Rayon sarees, though inexpensive, look as pretty as anything they wear. And Krishna can afford to buy them too.

We were the first to set up a plant in India for manufacturing rayon in 1950. Our production is constantly on the increase and it is helping to keep thousands of weaving establishments humming all the year round in many towns and villages of India.

We now produce yarn in finer and bleached varieties, and also make available *coloured yarn* for the first time in our country. In pioneering the rayon industry in India and in fostering these new developments, we are happy that we continue to play a vital role in the developing economy of our country.

TRAYONS

The Travancore Rayons Limited

India's Pioneer Manufacturers of Rayon Yarn

Factory:	*Sales Office:*
Rayonpuram P. O. Kerala State	**2/6, Second Line Beach, Madras-1**

Stockists:

Rayon Traders Private Ltd., *Madras: 27, Coral Merchant Street, Salem: 68/416, Main Road, Shevapet, Madurai: 114-A, South Masi Street, Coimbatore: United India Buildings, Avinasi Road,* **R. Sutramdas (India) Private Ltd.,** *United India Life Buildings, Sri Phirozshah Mehta Road, Bombay* **1, P. Vrajlal Dulabhdas & Co.,** *22, Brabourne Road, Calcutta-1*

There is a textured beauty from the natural fibre of coconut and Coir must adorn every Indian Home.

COIR IN INDIAN ECONOMY

Coir occupies a very important position in the national economy of India and production of this foreign exchange-earning commodity has a great bearing on employment particularly in Kerala state. The coconut palm has long been the core of the Southern most State of India's industrial structure. For generations Coir industry has been the 'life-line' of the Malabar Coast-and of such quality is the Indian Coir that with Ceylon, which is the only other coir producing country, India has acquired and maintained an unchallenged position in the world markets.

The Coir industry is basically a Cottage industry and the extraction of fibre and spinning of yarn are almost entirely done in Cottages and mostly by women. The number of people engaged in this industry is to the extent of six lakhs. The fact that 50 to 80 percent of the cost of production is shared by labour is an important feature of the industry. Apart from the problems of backward economy in which production is by primitive methods and marketing complicated by the presence of a multiplicity of middlemen and in which co-operative organisation has not become firmly established, the fundamental problem which faces large parts of the Malabar Coast is the human problem. In these parts where about 80 percent of the coconut husks available in the State are utilised industrially, leaving only a very small margin for further expansion of the industry, the earnings from the Coir industry naturally dwindle as the population grows from year to year and opportunities for alternative employment are few. It is one of the serious problems which is being tackled by the Coir Board. Now that several co-operatives have been formed, the position of the workers to that extent has improved.

Coir Mats and Matting Industry

The coir mats and matting industry is one of the well established industries of Kerala State with a history of about a century behind it. Although about 15,000 workers are employed in the manufacture of coir products alone in about 700 factories, it is important to bear in mind that the entire production is by manual labour. No attempt has been made to modernise equipment or production methods with a view to attain higher productivity for fear of displacement of labour.

Export Industry

The Coir industry is not only a sustainer of West Coast economy but also a substantial earner of foreign exchange for the country. Coir and Coir goods account for about 8 to 10 crores of rupees in India's foreign exchange. It is found that Coir exports of all kinds both in volume and value have expanded considerably between the pre-war and post-war periods. Our foreign markets for coir mats and mattings are the U.K. and other European countries, Canada, U.S.A., Australia and Newzealand. The fortunes of the industry are very largely dependent on the U.K. market which alone consumes nearly 72% of the output of the manufacturing industry. But since the last war, many of the European countries have restricted the import of coir floor coverings either because some of them manufacture coir mattings from coir yarn obtained from India or find other substitute material.

Potential demand

It has been stated very recently by the High Commission of India, Ottawa, that there is a potential demand for coir mats in Canada even though coloured coir matting may however require immediate changes for survival.

Again, India's export of coir products to the Middle East countries is stated to have registered an increase of about 65 percent during the past two years.

Hitherto U.S.S.R. has not been buyer of our Coir products. Some time back, the,

U. S. S. R. Trade Representatives visited the Coir Board's Show-room at Delhi and they have sent selected samples of coir products along with quotations to Moscow. It is hoped that Coir might get admittance into U. S. S. R. and countries within her orbit, thus helping to open out new markets for coir products.

It is reported that the Indian Exhibition organised by the Indian Embassy in China has evoked keen interest in India's Coir products.

Germany is a big consumer of carpets importing more than Rs. 6 crores worth of carpets and floor coverings of all varieties. According to the Indian Delegation which recently visited West Germany, notwithstanding the fact that very good carpets were being made in Germany and are also available in the market, Indian Coir Carpets have their own charm due to their luxurious pile, craftmanship and low price provided thinner varieties in wider range of qualities, designs and colours are exported.

Prospects for the future

Although India is still holding the monopoly for Coir, it is important to bear in mind that coir is only less than 3% of the total world production of hard fibres and even for this the industry has to depend for its existence mostly on foreign demands. This has its own drawbacks. Any slack in foreign demand or its incapacity to absorb the increased production here would undermine the stability of Coir's economy here. A continuously expanding market both at home and abroad is, therefore, essential for Coir's healthy existence.

The development of the market in India for Coir products is of the utmost importance for the industry. Unfortunately, however, the consumption of Indian markets has not exceeded than 250 tons, as against about 20,000 tons exported. If the uses of Coir floor coverings, especially door mats, are fully appreciated by Indian homes, there is every possibility for India itself absorbing the whole output of the Industry. The Coir Board has already taken on hand a vigorous propaganda drive in India. Apart from taking part in exhibitions and fairs in India and abroad, the Board has alse been devoting its attention to more enduring publicity material such as journal, brochure, folders, calendar and Catalogue.

* * *

COIR is a cottage industry product of India.
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16-A, Asaf Ali Road, New Delhi.
Kastur Nivas, French Road, (Off Hughes Road), Bombay-7.

Indian Textile Industry provides means of livelihood to about seven million people. Over Rs. 450 crores are invested in this Industry.

TEXTILE INDUSTRY

E. D. SHEPPARD

Chairman, The Kohinoor Mills Co. Ltd., Bombay

The Textile industry as a whole, many of you will be wondering how, with an ever-increasing population and greater earning capacity in the industrialised areas of the country, the demand for cloth has latterly fallen off. The villain of the piece has been last year's monsoon. It is an established fact that food prices and cloth prices are very closely linked. If the price of food goes up, the demand for cloth goes down. The vast majority of the population, already living on a bare subsistence level, could hardly eat less but they can always wear their old clothes for another year. This is the basic problem and until such time as the food position becomes easier with consequent lower prices, it is hard to foresee any real improvement in the Textile Industry. In this connection it is interesting to note that the fine count mills are thought, on the whole, to have fared better than others. I would suggest that this reflects the benefit they derive from selling their products to a public less affected by a rise in food prices. Medium count mills and coarse count mills are the ones who feel the pinch most.

There are of course other factors which affect the movement and sale of cloth. At all levels the whole-sale and retail trades are less able to hold stocks to meet future demands. Wealth and Expenditure Taxes have tightened everybody's purse strings and the credit squeeze has done the same. Another consideration is the high rate of Excise Duty. It is not only the monetary incidence of this Duty that is so irksome but also the bewildering frequency with which the Government sees fit to alter it. Merchants, understandably enough, do not want to burden themselves with large stocks, the value of which is liable to be reduced overnight if a sudden reduction is made in the rate of duty. These other factors do help to make the position more difficult but I wish to emphasise that less taxation, freer credit conditions and lower excise duties would not put more money into the pockets of the vast majority of people who buy cloth. It is the financial position of the man in the street and agriculturist that dictates what prices can be obtained and what profits can be made by your mill and the whole Industry.

You will note that sales of cloth, yarn and waste are lower by more than fifty lacs, while stocks of finished goods are up compared with those at the end of 1956. I would like to

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comment briefly on the effect of the large holding of stocks by mills in general. Owing to the fall in demand, many mills have had to pile up stocks in their godowns and when they need money to make purchases or to pay wages, they sell off a portion of these stocks, often at give-away prices. How does this affect us? While, generally speaking, we get a favourable price for our goods, there is a limit to the premium that people will pay for the name "Kohinoor". These emergency sales of accumulated stocks by various mills have a very real effect in depressing the market for all of us. It is reported that a number of mills are closing down shifts which will slow down the rate of stock accumulation. I feel that in time, therefore, the basic economic law of supply and demand may prevail to the benefit of the whole Industry.

As you are aware, half of the output of your mills is in the form of sewing thread and yarn, and there is an over-production of yarn in the country. This has been brought about by Government's vacillating policy of allowing, and then prohibiting, exports from time to time as the years went by. The overseas buyer soon got tired of relying on these intermittent supplies and looked for source whence he could obtain his requirements regularly as and when he wanted them. Thus Pakistan and Hongkong were enabled to replace India as suppliers of yarn to many markets previously served by India and it looks as if most of these markets are lost permanently. In the meantime, the Handlooms which were expected to consume the additional yarn thus retained in the country have failed to do so. The idea that exports are things that can be turned on and off like a tap, can have duties imposed on them at will still continue to flourish whenever required, is quite fallacious. The foreign buyer may put up with these conditions for a while,

but in the meantime he is busily engaged seeking alternative sources of supply and it is usually not long before he finds them. India is desperately in need of Foreign Exchange and in order to earn it a long-term settled Export Policy is essential, even at the risk of some temporary shortages at home. Let us hope that no further obstacles will be placed in the way of exports of yarn and sewing thread and that even at this late hour we may be able to retrieve the position to some extent.

In the meantime, owing to the unremunerative prices of weaving yarn many Mills are entering the sewing thread market with the result that keen competition has brought the price down to very near the cost level.

Import licences continue to be given on a piecemeal basis which makes purchasing and the planning of future production most difficult. These licences were formerly granted on a "first come, first served" system. I feel that the present quota system, unsatisfactory though it might be, is a far more fair way of allocating the small imports that may be allowed. While urging the Government to continue this system, I would appeal once again for a more far-reaching system of import licences. The country's resources and the Mill Industry's needs can be forecast fairly accurately from year to year, so there seems to be no reason why an import policy for the 12 month period cannot be worked out.

I wish to say a few words about another matter which has been worrying us for some time. Ever since the virtual elimination of imports of Rayon Yarn, the local prices have risen very considerably. While there has been a fractional increase in the price of finished Rayon Cloth, it in no way covers the higher price that now has to be paid for the yarn. This is a problem affecting not merely our No. 3 Mill, which as you know is mainly engaged in the production of Rayon Cloth, but also many smaller units which may be forced to go out of production. It will be in the best interests of the local manufacturers of Rayon, therefore, to ensure that a fair method of distribution at reasonable prices is arranged so that the Art Silk Industry may not be overtaken by shut-downs and unemployment.

* * *

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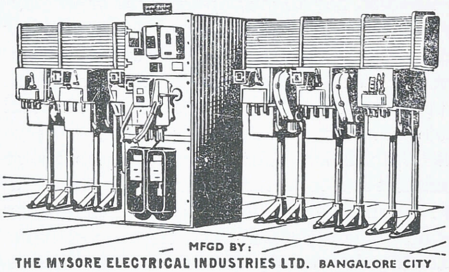

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I.A.E.C.

Research and progress are synonimous in any industry and the Institute is doing a lot for the fruition of both.

THE CENTRAL LEATHER RESEARCH INSTITUTE

The Indian Leather Industry has made considerable progress within the last hundred years or so and ranks today as one of the foremost industries of the country. However, in comparison with the leather industries of Europe and America, it lags behind in both the quality and quantity of its production. It was in this context that the Council of Scientific & Industrial Research, appreciating the importance of research for the development of this Industry, appointed in 1944 a Leather Research Committee. The early establishment of a Leather Research Institute was one of the recommendations of this Committee; the recommendation soon crystallised itself in the founding of Central Leather Research Institute in Madras. The Institute was formally declared open on January, 15, 1953.

The main objective of the Institute is to assist the Indian Leather Industry in its development, by making available to it the benefits of the recent advances in science and technology. This it seeks to do by acquiring the necessary technical knowledge through acquired pure and applied research, by dissemination of the knowledge thus acquired and by training leather technologists. In conformity with these aims, the Institute has several well-equipped laboratories, a model tannery to translate the laboratory research, and an effective machinery for taking the useful results obtained, to the Industry. The research programme of the Institute has been geared to the immediate needs and problems of the Industry, existing at various levels, *viz.*, village, small scale and large scale, and connected with its various phases-raw materials, tanning materials, auxiliaries, etc.

Broadly speaking the following are the facets of the research carried out with some success, at the Institute :—

(*a*) Ensuring better quality of raw hides and skins:—Histological, bacteriological, entomological and mycological studies figure in investigations concerning this aspect; the effect of damages caused to hide on leather

making, the remedies and the preparation and use of curing agents for better preservation and storage of raw hides and skins are dealt with.

(*b*) Better utilisation of indigenous tanning materials: One of the major branches of the Indian Leather Industry-the vegetable tanning industry has been largely depending upon imported material-wattle bark and wattle extract. The country has a rich flora amongst which several promising substitutes have been found, and their availability and commercial exploitation are being studied.

(*c*) Investigations regarding feasibility of manufacture of several of the vital auxiliaries from indigenous materials.

At present, most of the several auxiliary materials that go into the making of the finished leathers are being imported. Researches carried out have shown that some of these like enzyme bate and enzyme depilant, pigment finishes, fat liquors, binders, syntans, shoe polishes and adhesives could be produced with profit using locally available materials. Some of these are being made on a pilot plant scale and supplied to the industry regularly.

(*d*) Modification of some of the existing techniques with a view to reduce the costs or improve the quality of the leathers:

Indigenous techniques like bag tanning and E. I. tanning have been in vogue for a long time. However, it has been shown that they could stand some modifications resulting in saving of time, labour and material. 4 processes have also been worked out for finishing E. I. leathers fetching higher returns for the same.

(*e*) Developing processes for the manufacturing of various leathers: If the leather industry is to cater fully to the internal needs and satisfy foreign demands also, it has to produce a variety of leathers. Work at the Institute has shown the potentiality for manufacture of leathers like glazed kid, white, chrome retan, semichrome, fancy and Industrial leathers. Some of these lines of production are in existence in the country and it is hoped that the work at the Institute would promote further development in this direction. The E. I. tanned leathers especially, would be of greater value if they are exported fully dressed and finished.

(*f*) Utilisation of Tannery bye-products:

The leather trimmings, shavings and cuttings go to waste, at present. However, they can be converted into leather boards thus increasing their value. Similarly the splits and rejection leathers can be converted into fancy leather fetching higher returns. Methods for these have been worked out at the Institute. Methods have also been developed for the salvage, cleaning and bleaching of hair to fetch better prices.

(*g*) Dissemination of Research Results: The methods and materials developed as above are given to the trade for trial and those that are approved are demonstrated practically to the tanners from the raw to the finish. The tanner, who comes across difficulties in utilising these processes at his tannery is helped by the Extension Service in getting over them. The monthly Bulletin published by the Institute, the Open House and the Symposia held periodically and the process bulletins publised are the other tools of disseminating technical information. It is significant that the institute is answering a large number of technical enquiries also.

(*h*) Training: The Institute offers with the co-operation of the Madras University, facilities for the B.Sc., M.Sc., and Ph. D degrees in Leather Technology. Short term refresher courses are also available for those who wish to get fully acquainted with the modern tools and techniques.

Research and progress are synonymous in any industry and the Indian Leather Industry can reach its goal of exporting solely finished leather and leather goods, only by adopting improved processes and techniques developed through research. It is hoped that the researches carried out at the Institute will be fully utilised by the Industry.

***

In electric lamp production India is making astonishing progress and this article brilliantly portrays lamp manufacture step by step.

ELECTRIC LAMPS

This History of Electric Lamps dates back to the time of Alwa Edwin Edison (1879). As a result of his repeated Researches he was able to produce the Incandescent Lamps making use of Carbon Filaments achieving a life of about 500 hours. Ever since that time, the Industry has developed with new improvised Techniques making larger production with increased light out-put, all such lamps giving 1000 hours of burning life.

The principle of Electric Lamp is fairly simple. With the Electric current passing through a metallic wire it results in heating and the matter is raised to incandescence. It is this light out-put which a lamp engineer attempts to conserve to simply increasing the efficiency of the lamps, other qualities being equal. It is therefore apparent that the high melting point of Tungsten (3400 Deg. C) has a very important advantage in the economic production of light. Though Tungsten is ideally suited as a filamentary body, the technique of drawing the material into a thin wire involves the entire engineering skill at command. The Wolfram Ore is crushed and brought to a powder form. This powder is pressed into a small bricket and these brickets are pressed into bars (10 x 20 mm. Square) and from 8 x 24" in length. The strength of the bar is increased by heating it in hydrogen. These bars are further subjected to a treatment known as "Sintering". The sintered bars are further subjected to a process "Swaging" where very rapidly rotating hammers around the axix of the tungsten rod convert tungsten into thick wires. These thick wires are passed through Diamond Dies through special lubrications to various required sizes and these are called drawn tungsten wire. Tungsten while it is yet in powder form it is customary to add certain Oxides so that the growth of the crystals can be controlled to maintain the luminosity. It is at this stage various grades of wire are developed for various types of lamps depending upon the efficiency of the lamp required.

Simultaneously for tungsten filaments a special wire was devised so that it could be pinched into a glass making it vacuum tight. Such an economical alloy is "dumet". This revolutionises the working out of the cost of the Lamp production.

It was found that if the filament inside the lamp was subjected to an increased pressure it could be operated to a higher temperature for the same wattage and in consequence the Gas-filled lamps were developed. The straight wire that was used in the vacuum lamp had to be redesigned into a single coil or coiled coil as the case may be to minimise the loss of heat by way of convection when it was surrounded by gas pressure inside the lamp. Needless to mention that the gas must be inert in view of the high temperature of the filament inside the lamp. Hence, normally Argon and Nitrogen are the chief Gases required in this Industry. Sometimes, "Helium" and "Xenon" gases are also used to get higher efficiency lamps in special cases. Each of these inert gases in various proportions at various pressures inside the lamp exhibit special characteristics in luminosity and every Factory has its own special proportions. Inspite of such improvised techniques in Lamp Engineering, it may appear strange that in a 100 W. Incandescent Lamp, the Lamp Engineer has utilised about 12% of the input energy while 88% is converted into heat and removed from the lamp by radiation, by evacuation and by conduction.

Production

The first stage during manufacture is Stem Making. The two Electrodes, the evacuating glass tube, the flare and the cane are alligned properly and they pass through a process wherein a vacuum is made at the Dumet. At this stage a small bore is made at the pinch to facilitate evacuation at the Exhaust. These stems are passed on to the Anchroing Machines where a small button is made at the tip of the cane and the Molybdenum Wire is inserted. It is very interesting that small lengths are cut and at the end of each the pigtail hooks are made at a fairly fast rate at the automatic machines. These Machines are designed to accommodate from 1 to 24 supports, depending upon the type of the lamp. These anchored stems pass on to the Mouting Mill where the

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MYSORE LAMPS

BEST IN THE MARKET

Awarded Gold Medals & Cups at Several Exhibitions

under Government of India Rate Contract

All Types of Lamps Manufactured

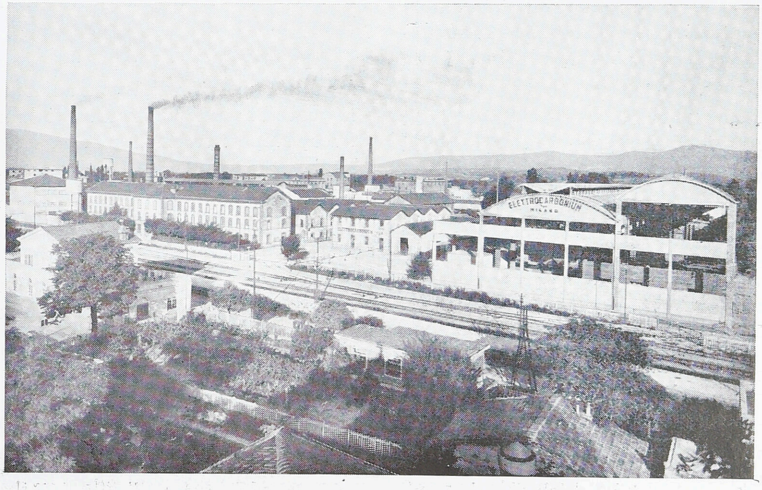
The Mysore Lamp Works Ltd.,

MALLESWARAM - - - BANGALORE-3.

filaments are automatically packed up, clamped and mounted. Generally such mouting mill is very costly and hence it is the normal practice to use leg-operated mechanical Clampers engaging more Operators. This is typically suited for our Indian conditions, where unemployment is a problem in our country. Moreover, even for lesser labour we are fortunate to get more intelligent and skilled labour in our country. For this delicate process girls are specially suited.

The mounted stem passes on to the Sealing Machine wherein the Bulbs are sealed to the Flare and the extra cullet is automatically removed and the sealed bulb passes on to the Vacuum Pumps. At this stage of Exhausting, the Lamp passes through a heating temperature and simultaneously suction is going on. In this process all the gases from the glass walls are released and pumped out. After a sufficient high degree of vacuum is attained, the inert gases are filled in and finally the exhaust tube is sealed off automatically. Now the lamp is ready to receive the Brass Caps. This is the finishing stage where the Brass Cap with a thin ribbon of the bakelite cement at the neck will be fitted and subjected to baking. This will result in glass to melt still and finally they are soldered at the eye-let and outside. It is the commercial practice to give a coating of Red Phosphorous on the filament itself before it is sealed. After finishing of the lamp, the lamp is lighted up in very low voltages so that the phosphorous may get pulcerated into small highly reactive particles and as a result electrically charged. In such a condition, the highly reactive phosphorous will absorb the extraneous matter within the lamp. This process being a surface absorption is called "Absorption". This pressure comes from high vacuum and the process is called "Flash Ageing".

The Day's production undergoes systematic check-up at regular intervals at the Photometry. These lamps at present are being designed for the British Standard Specification, the normal average life being 1000 hours. It is important that every process during manufacture must be rigorously controlled and inspected. Periodically sub-standards are got from the authorised Testing Laboratories so that the production is standardised for its uniformity and high quality.



A panoramic view of the Electrocarbonium plant at Narni

Two decades of tireless work and a zeal to succeed have brought Sulekha Works to the forefront of glory.

SULEKHA FOUNTAIN PEN INK
ITS ROMANCE

From a Humble Beginning

Rising from a tiny attempt to a notable achievement, Sulekha organisation is a striking example of a national enterprise inspired by an ideological zeal growing into an invaluable asset of the nation. By dint of sheer institutional excellence, it is something of which India can justly be proud of.

It is, of course, not a tale of overnight miracle but that of incessant endeavour and and persistent research of over two decades. The target, now happily achieved, was to produce a cent-per-cent Indian Ink that would not only compete with and drive away the foreign products but would out-class them. That "Sulekha Ink" is the 'World's Best' is not an idle dream but a reality to-day as it can stand any test of the qualities claimed by any ink.

The largest factory in Eastern World

Sulekha Works Ltd., of which Sulekha Ink is the most famous product, with the highest sale in India, is one of the foremost manufacturers of Fountain Pen Ink in the world while its factory at Sulekha Park in South Calcutta with its extension at Sodepur, in 24-Parganas, is the largest of its kind in the Eastern World.

Fully equipped with modern plants and machinery, the whole manufacturing process is geared to function with the utmost care in every step of production from raw-materials to packaging. To give a more practical idea, some of the processes are described below:

1. A stainless-steel automatic plant run by a 10—H. P vertical boiler has been installed for the production of Distilled water with which the ink is made to eliminate any possibility of the presence of unknown dissolved matters in it.

2. The automatic washing machine cleanses the bottles by flushing distilled water and steam injected at a high

pressure to remove the risk of careless washing by any individual workers.

3. The ink is finally filtered with the help of electric-driven rubber - lined vaccumm horizontal filter to remove the slightest sediments therefrom that may have thrown during maturation.
4. The filling of ink bottles is done by automatic vaccuam filler in order to avoid air and dust during the process as well as to ensure specified quantity of ink in the bottles.
5. As a safeguard against imitation which is a common evil for any good products, the bottles are sealed with the help of pilfer-proof metal-sealing machine.
6. The testing and analytical laboratories of the Company are also well-equipped and suitable for work of a very high standard. At every stage of manufacture the product undergoes thorough testing by experienced chemists in the laboratory equipped, for the purpose, with Analytical Balance, Electric PH-Meter, Lovibond Tintometer, Viscometer, Electric Thermostat, Autoclave, Microscope, etc.

Thus, utilising all the latest invention of science, Sulekha Ink maintains a progressive curve of improvement with regard to the quality of the product. The present Sulekha Ink is incomparable in its *colour and brilliance, flow and smoothness, safety and economy.*

Solvent "S-100"

The introduction of solvent "S-100" which has, so to say, revolutionised the Fountain Pen Ink Industry is a normal and regular feature of the Sulekha Ink. Solvent "S-100" not only helps the flow in all climate and temperature, but also cleanses the pen, protects the nib from acid action and removes all chances of sedimentation. As a result, Sulekha Ink, which dries quickly on the paper, *does not dry* on the bib even when it is kept open for a reasonably long time.

Other Products

The stamp of quality that characterises Sulekha Ink has also made its other products already popular. These products include (1) Writing Ink, (2) Ink Tablet, (3) Ink Powder, (4) Marking Ink, (5) Stamp Pad, (6) Stamp Pad Ink, (7) Stencil Ink, (8) Office Paste, (9) Liquid Gum, (10) Sealing Wax, etc.

The financial aspect

A study of sale and profit of the Company for the last five years with distribution of dividends will amply testify to the remarkable growth and soundness of the institution.

A comparative study of our sale & profit of last 5 years.

Years.		Sale.		Profit.	Dividend.
1953	Rs	7,75,095/-	Rs.	75,893/-	7%
1954	,,	10,37,457/-	,,	86.035/-	7%
1955	,,	15,35,533/-	,,	1,14,439/-	8%
1956	,,	19,80,637/-	,,	1,38,049/-	10%
1957	,,	25,00,000/-		(Pre Audit)	

The organisational strength

Besides the Management, the workmen & technician, staff and officers, agents and representatives most of which are middleclass refugees from East Pakistan have also played important role in the progress of the industry. Their sincerity and devotion, their efficiency and co-operation, their energy and solidarity have really made what Sulekha is to-day. At prosent not less than 500 men are working within the fold of this organisation which once started with a couple of promoters only some twenty four years ago.

Besides, thousands of people working in other industries are directly or indirectly benifited by this organisation.

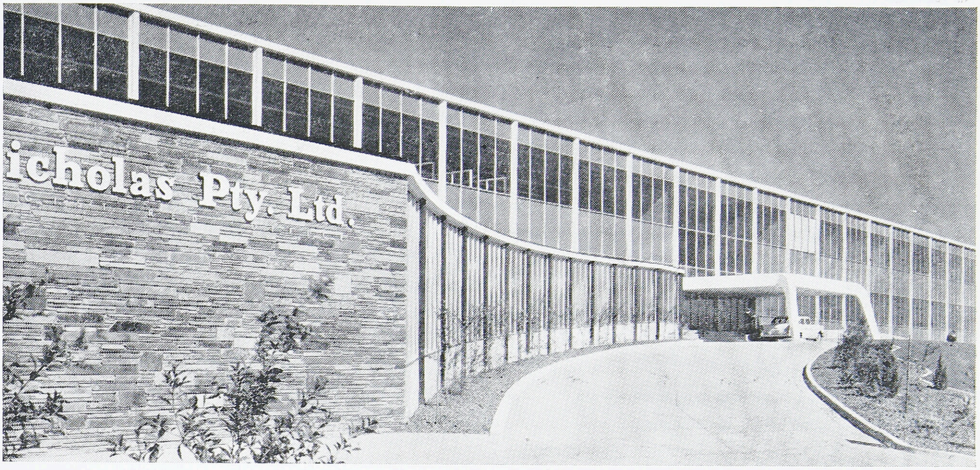
Concluding Note

Sulekha Ink has positivly demonstrated the value of the quality of a product backed by the integrity of an institution and has set an example to all new national enterprises that alone can make our hard-earned freedom worthwhile.

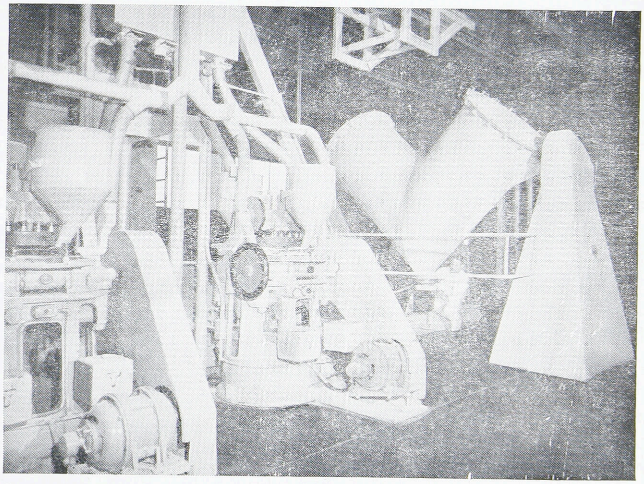
Shri Diwakar, Governor of Bihar, at the Sulekha Stall in Hyderabad Congress Exhibition

Before concluding, we gratefully remember the sympathy and support received by us by innumerable customers and traders of this vast country, who have shown by their action that they are not at all prey to prejudice against indigenous articles, which was generally the complaint of many manufacturers. As a matter of fact, the prejudice that had gained ground at the early period of our industrial era has now almost gone with the improvement of quality of indigenous products. We are really pleased to see that it was so at least in Fountain Pen Ink Industry where Sulekha Fountain Pen Ink, which is purely an Indian product, being made with Indian Capital, Indian Labour and Indian Management has come to stay in the field even against free competition of "Foreign" brands of Fountain Pen Inks that were once well reputed in India. Thus, the ideology which once caused the promoters of Sulekha to take the enterprise as their mission of life has become completely fulfilled to day although after a long and strenuous struggle for ever two decades.

* * *



ASPRO'S WORLD HEADQUARTERS



This organisation which began modestly in 1915, sells its pharmaceutical products in 100 countries and manufactures them in 13. Today Nicholas ASPRO factories supply hospital, household, agricultural and veterinary drugs on the world market

Materials for ASPRO passing through blenders to the two compressing machines, centre and left

This illustrious Firm's contribution to India's expanding industrial economy is really admirable.

INDIAN OXYGEN

The recent industrial development which received further stimulus from the expansion schemes envisaged under the Second Five Year Plan, has considerably increased the demand for oxygen, acetylene and other industrial gases. The iron and steel industry is by far the biggest user of industrial gases and the rapid growth of this industry has given a fillip to the already rising demand for oxygen and other gases; this in turn has added to the requirements of other consumable items (arc welding electrodes, welding rods and fluxes), welding and cutting equipment and accessories.

The major manufacturing unit in this field of production and distribution was The Indian Oxygen & Acetylene Co. Private Ltd., a subsidiary of the British Oxygen Co. Ltd., with associated companies in Africa, Australia, Burma, Canada, Ceylon, Eire, Hong Kong, Malaya, New Zealand, Norway, Pakistan and the U. K. This unit in India has progressively built up a network of production centres in different parts of the country. The Company is currently building a new factory at Burnpur, West Bengal, which is expected to start production shortly.

This Company besides catering to the diversifed requirements of Indian Industry, has been giving service to the medical profession by supplying medical gases-medical oxygen and nitrous oxide, and anaesthetic and analgesic apparatus.

The first major diversification in the range of products taken up by this Company came with the manufacture of nitrous oxide in 1943. This gas is well known for its anaesthetic properties and is sometimes called 'Laughing Gas'.

Another important step was the establishment of manufacture of mild steel arc welding electrodes in 1947. Since then, production has increased sixfold and a new factory at Khardah, near Calcutta, is nearing completion.

The Company's products are familiar to many because of the steel cylinders which are seen conveying their gases. Actually, since 1951, an increasing proportion of the oxygen sales have been made in liquid form. This offers major transport economies and eliminates the use of small cylinders, due to employment of special evaporating equipment at customers' premises, for converting liquid oxygen into gas.

Another interesting use of liquid oxygen is for explosive purpose in conjunction with special cartridges; an important feature of this process is that an explosive is not created until the moment of use when the cartridge is soaked in oxygen.

Oxygen and acetylene have long been associated with the steel industry and metal fabrication. In India, these gases are being supplied increasingly to the existing steel works and the engineering industry generally. Today, they are also being used in the erection of the new steelworks in the Public Sector. No expanding industrial economy can work without these gases, which both join and sever metals. Now a new gas has come into the field of welding - " Argon ", and the Company has included its production in its development plans.

Gases and welding electrodes cannot be used without necessary tools; such equipment produced by British Oxygen Company and Quasi-Arc Ltd.—its electric welding subsidiary in England, have become firmly established in India. One of the Company's latest developments is a phased programme for the assembly and manufacture of oxy-acetylene welding and cutting equipment, based on the British Oxygen Company's designs. This step will contribute to the savings in foreign exchange; the manufacture of transformer are welding sets is also being planned with the same object in view.

The Company enjoys the benefits of the British Oxygen Company's research and development facilities and there is an unrestricted flow of technical and marketing information and assistance to promote the development of welding and its allied processes in India

Today, the Company provides employment for 2,400 persons throughout India, including some 90 senior staff. The latter total includes 11 U. K. nationals; of the three executive directors one is an Indian. Most of the senior Indian executives have undergone periods of training in the U. K, for which facilities are readily offered by the Parent Company.

Since its incorporation, the Company has progressively expanded both its volume of production and its range of products and is now the main supplier of India's requirements of industrial gases and equipment for welding, cutting and various other processes involving the use of such gases.

An indication of this progressive expansion is given by the following figures showing the total sales turnover in rupees during the last ten years·

1948	**1949**	**1950**
1,08,52,445	1,36,59,064	1,33,03,772
1951	**1952**	**1953**
1,53,97,836	1,69,25,955	1,97,39,770
1954	**1955**	**1956**
2,34,03,420	2,67,96,882	3,45,59,726
	1957	
	4,17,75,429	

In view of the wide replacement and expansion programmes taken in hand to cope with the new demands for its products, it is natural that the Company is now converted into a Public Limited Company, with a simpler and shorter name-" Indian Oxygen Limited ". The issued capital was recently increased by the sale of additional shares to the British Oxygen Company Ltd., who last year applied for permission to sell 30% of their shareholdings in the Indian Company to the public in India. This offer for sale of 600,000 ordinary shares of Rs. 10/- each fully paid has since been over-subscribed.

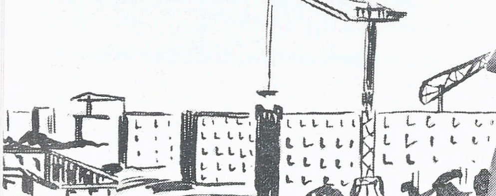
* * *

Invest in Government of India
SMALL SAVINGS SCHEME

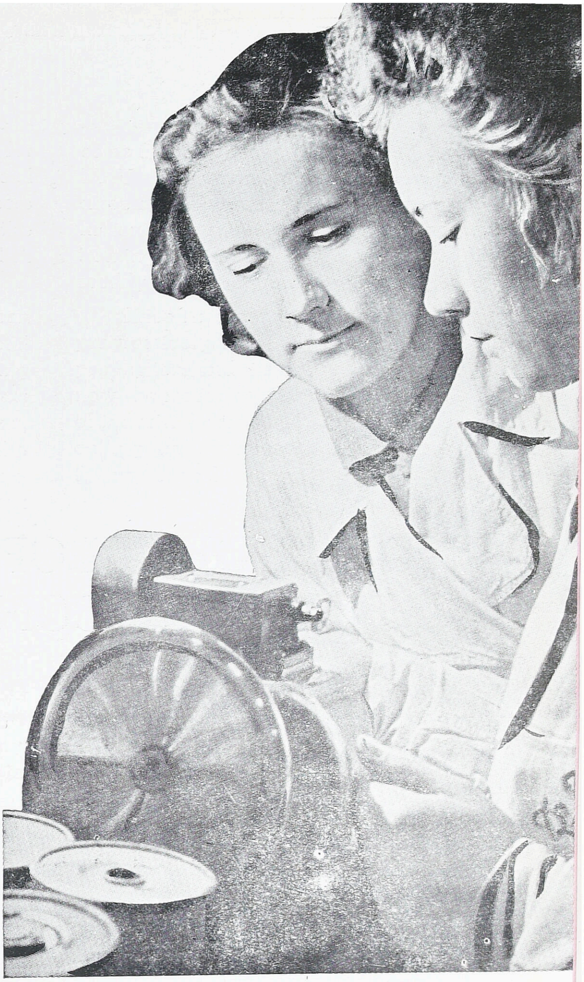
SOVIET UNION'S

The last stitch is always the most difficult. Roza is working overtime today: she wants to finish the coat and hand it to the customer

Vasili in the cab of his lorry



SINCERE WORKERS



Vera Varvarkina and her friend Pania Khmelevskaya

Vera Varvarkina, leader of production team of armature winders

Magnificent is the part played by A. E. I. in India's mighty projects.

INDIA'S DEVELOPMENT PROJECTS A. E. I.'S CONTRIBUTION

H. C. HARDY, M. I. A. E. E., A. M. I. E. E.

Chief Engineer & Director, A. E. I., Calcutta

Among the basic requirements of economic development, the generation and distribution of electrical power has benefited from the contribution made by the A. E. I. organisation, backed by the considerable technical resources of the constituent companies.

From the beginning of development in India of high voltage technique, A. E. I. have studied the suitability of the plant supplied by them for the onerous climatic conditions to be met in India and in many instances, details of design incorporated in the electrical apparatus have been influenced by the Indian operating requirements.

In addition to supplying equipment, consulting services have been rendered in the case of many projects, particularly in the early stages of development. Such services comprise electrical system studies, load surveys and design of complete electrical projects. The aggregate capacities of the more important types of equipment so far supplied to, or on order from the different electricity undertakings illustrate the part played by this Company in furthering electrical development in India.

Waterwheel generators of an aggregate capacity exceeding .8 million KW.

Thermal power plants of about ·68 million KW (both State and private owned).

Transformers of over 1 million kVA.

About 500 outdoor oil circuit breakers for voltages 33-kV and above.

The contribution of Messrs Associated Electrical Industries Manufacturing Co. Private Ltd., is also significant. Many transformers and about 2500 outdoor type gang operated isolating switches for voltages in the range 3.3 kV to 132 kV have been supplied by Associated Electrical Industries Manufacturing Co., for

various electrification projects, also large quantities of motors and transformers for industrial use.

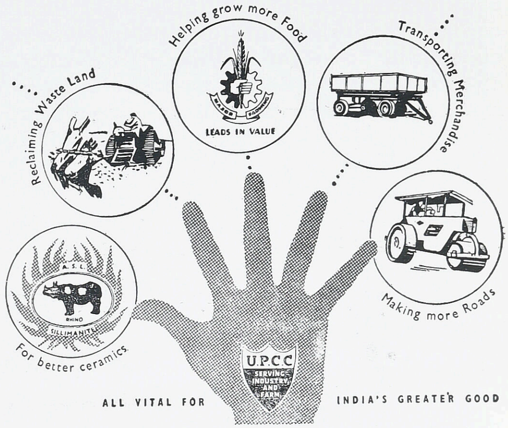
In point of fact, whether the gigantic Damodar Valley Project, Bhakra-Nangal in the East Punjab, Hirakud in Orissa, Khaperkheda Thermal Scheme in Madhya Pradesh, Machkund in Andhra, or the modest Duduma Transmission Scheme in Orissa, North Calcutta Rural Electrification Scheme in West Bengal, to mention only a few, there is hardly any electrical scheme included in the first Plan in which this Company did not participate, in one way or other. The following is a very brief account of the association of this Company with some of the many power projects which were included in the first plan.

Of the several hydro-electric projects in which this Company participated, the Hirakud Project in Orissa may be particularly mentioned. Apart from the supply of complete indoor and outdoor switchgear for the power station, comprising British Thomson-Houston power transformers, ranging from 2 to 42 MVA, voltage ratios 132/11-kV, 132/66-kV, 66/11-kV, with an aggregate capacity of 167,000 kVA, large numbers of Metropolitan-Vickers 132 kV and 66 kV oil circuit breakers and A.E.I.M. gang operated, outdoor type, isolating switches, the outdoor switching station as well as the supporting structures were designed by this Company. Erection, testing and commissioning of the plant supplied, under expert supervision, were also undertaken by the Company.

In the field of thermal power, of the many schemes which this Company executed, the first stage of the Khaperkheda Thermal Scheme and the Grid Substations in the state of Madhya Pradesh, deserve mentioning. For the Khaperkheda Power Station, three 10,000 KW steam turbo-alternator sets of of M/s. Metropolitan-Vickers manufacture, complete with all auxiliaries and power station switchgear, were supplied by this Company. For the Grid Substations, which were completely engineered by this Company, the equipments supplied include Metropolitan-Vickers power transformers ranging from 500 to 12,500 kVA, voltage ratios 66-kV/11-kV, total kVA 85,000, outdoor and indoor switchgear manufactured by M/s. Ferguson Pailin Ltd.; complete erection, testing and commissioning also being carried out.

There is yet another field, namely, electric traction, with which this Company has been actively engaged since its inception in India. In recognition of the Company's specialised experience in this regard, an order was received for equipments pertaining to the Railway Electrification Project of the Howrah-Burdwan main line and Tarakeshwar branch line. The order comprises of thirty-six complete sets of 3000 volt D. C. traction equipment for 3-car trains, each having one 840 h. p. motor coach and two trailer coaches; six 3000 volt rectifier substatians (total capacity 32,000 KW) compris-ing twelve pumpless, air cooled, steel tank

IN 5 WAYS
UPCC
are contributing to the
SECOND 5 YEAR PLAN



THE UNITED PROVINCES COMMERCIAL CORPORATION
6, Ganesh Chandra Avenue, Calcutta-13
PPS/UP-108/58.

rectifiers, fiftyone D.C. high speed circuit breakers and auxiliary plant, four 3000 volt track sectioning cabins, having a total of twenty-two D.C. high speed circuit breakers and associated equipment.

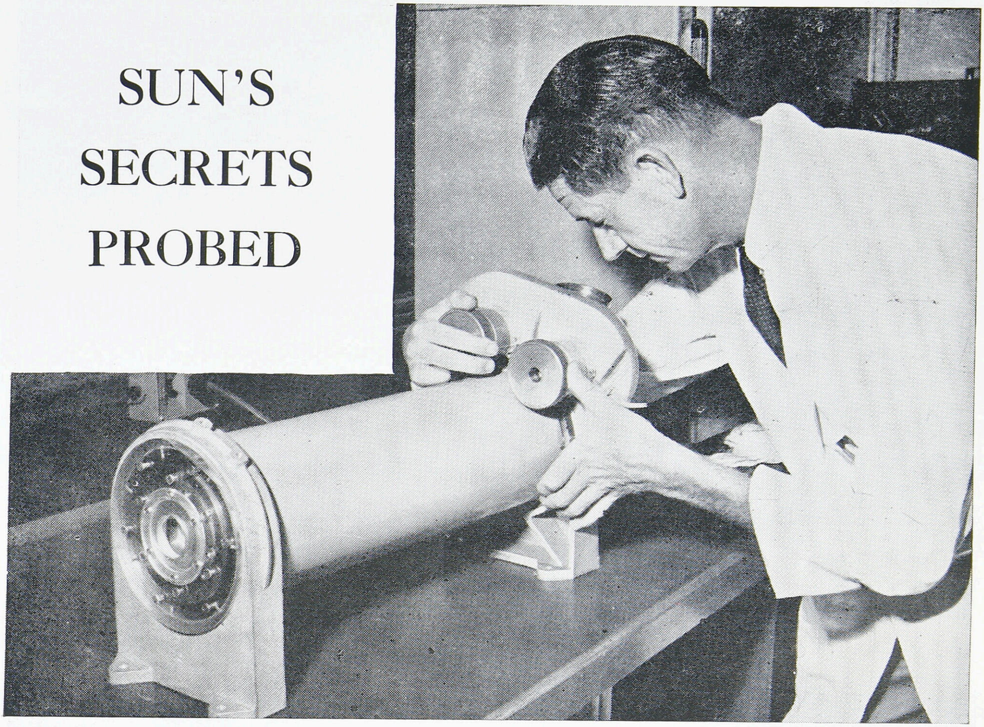
The equipments are designed to permit a maximum speed of 65 m.p.h. on level track with a fully loaded train and a starting acceleration of 1.2 m.p.h. per second up to 25 m.p.h. Worthy of particular note is the fact that approximately 15 percent of the traction equipment is being manufactured in India. This manufacture is being carried out by Associated Electrical Industries Manufacturing Co. to the designs of Metropolitan-Vickers. This is the first occasion on which electrical traction equipment has been manufactured in India, and represents a substantial and welcome saving in foreign exchange.

The fixed equipment, *i.e.* rectifiers, transformers, etc., have been manufactured by the British Thomson-Houston Co., and here again the local manufacture of some of the high speed D.C. circuit breaker equipments has been carried out in India.

Among the several electrical projects under the Second Plan, with which the Company is associated, one example is the Bhakra Power Station in East Punjab, for which the Company will shortly be delivering five 100,000 kVA (maximum rating 115,000) water wheel generators, the biggest capacity so far installed in India.

In Soviet Union, Labour and a rigid schedule of the day constitute the basis of re-education of criminals. These former thieves are acquiring skill as shoemakers

SUN'S SECRETS PROBED



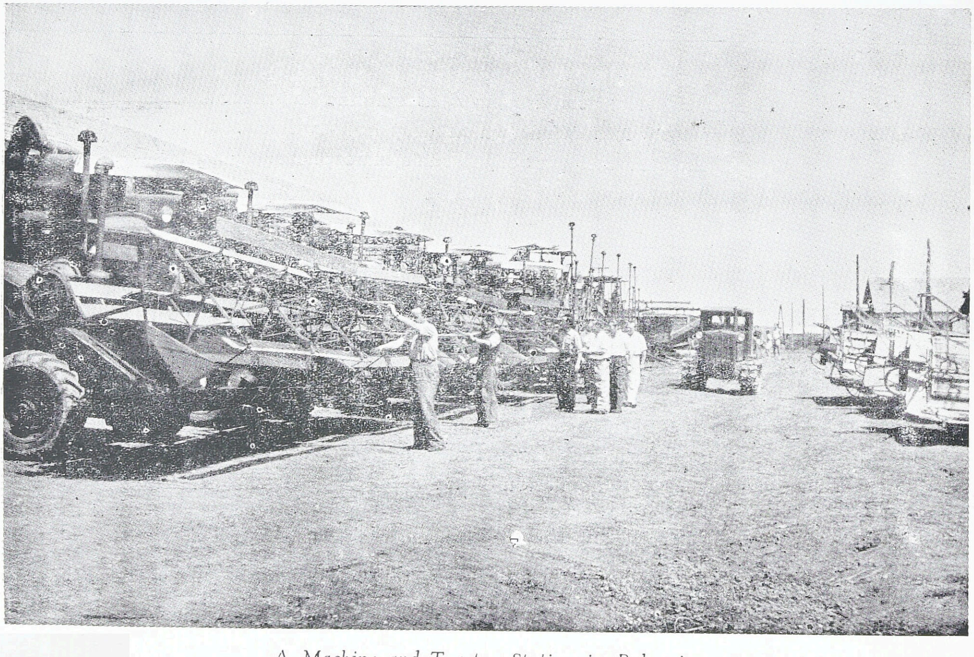
Australian scientists are now assembling a revolutionary new instrument which they hope will reveal the various layers of the sun's atmosphere.

The solar physics group in Sydney has pioneered the technique for interpreting radiation from hot gases such as hydrogen and helium as they occur in the sun.

It has made important discoveries in sun-spot development and that surges come from sun-flares that show diffuse expansion.

It pioneered the work of an electromagnetic theory of solar flares and discovered a new flare involving the emission of hot material.

One of the hundreds of newly-built residential buildings in Sofia



A Machine-and-Tractor Station in Bulgaria

Sixty years ago the first pneumatic tyre arrived in Bombay and from that date commenced Dunlop's association with India.

DUNLOP IN INDIA

In the closing years of the last century, the modern India we know today had just started taking shape. Numerous textile mills had sprung up in and around Bombay. Jute mills were flourishing in Bengal; the railway system was gradually branching out to all parts of the land and a beginning had been made in the industrial sphere.

It was in this setting that the first pneumatic bicycle tyre arrived in Bombay, in November 1898. By then, John Boyd Dunlop's leisure time experiments had been transformed into a successful industry in England.

Mr. R. J. C. Park, representative of the parent Company, was largely responsible for opening the Dunlop Company in this sub-continent. The manner in which it came into being is best described in his own words:

"... After my appointment to open and develop the Overseas business of the Company in 1897, I toured the whole of South America, the West Indies and then the States. Following that I went to South and East Africa to organise the business there. During that time, Mr. Arthur Huet was appointed to India to open up that branch of the business and arrived in Bombay in November 1898, but was taken ill and I was cabled to proceed to India, which I reached shortly after.

The goods taken over by Mr. Huet were stored in a godown and he had an office next to a firm of Silversmiths. There was a small stock of tyres in the office, which in those days where hand made, and the result was that the whole of the Silversmith's shop was blackened by the sulphur from the tyres.

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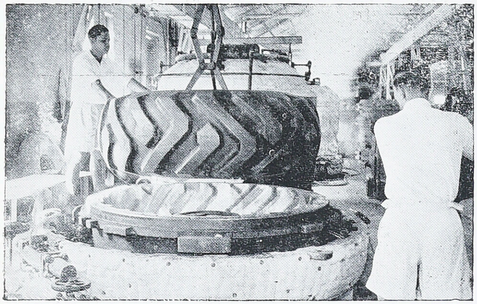


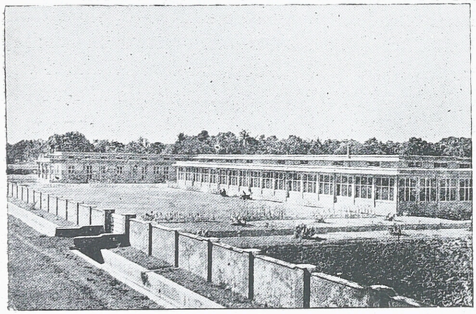
Plant for manufacture of large earthmover tyres

Consequently, they brought an action against the Company, which, however, I was able to settle satisfactorily on the condition that we left the building......"

Development of the Company

The founding of the Tata Iron & Steel Co. Ltd., in 1911, was a significant landmark in the industrial history of the country. In 1914, World War I cut off all imports for four years and isolated, India was thrown back upon her own resources. Indigenous industry thus received a great impetus.

With greater economic activity and mounting needs of industry, ever increasing demands were being made upon the country's transport. Increasing responsibility of servicing the nation's transport requirements devolved upon Dunlop. To cope with the growing volume of work, branches had to be opened all over the country. Depots are now located in Calcutta, Bombay, Madras, Delhi, Lucknow and Hyderabad with sub-depots at Nagpur, Ahmedabad, Bangalore, Ernakulam and Gauhati.

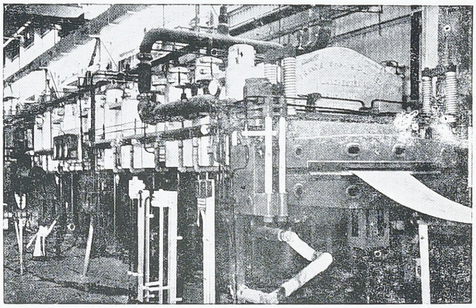


Dunlop Factory Hospital

Another noteworthy event was the opening of "Dunlop House" in Calcutta in 1928. Bombay was still the Head Office as it had been from the beginning. It was only in 1935 that it was decided to transfer the Head Office to Calcutta to be in close proximity to the factory which was then under construction.

The Founding of the Factory

Thirty-six miles away from Calcutta, off the Grand Trunk Road, leading North lies the



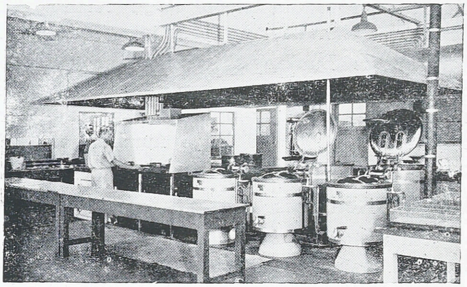
The giant Hydraulic Belting Press at the Dunlop Factory, Sahaganj

small village of Sahaganj on the river Hooghly. For miles and miles out of Calcutta on both its banks are innumerable mills, manufacturing mostly jute. Sahaganj, too, had a jute mill but its American management closed it down during the slump.

The search for a suitable home for the factory which Dunlop was proposing to build led to the untenanted mill at Sahaganj. It was well served by river, road and rail transport. The main E.I.R. line (as it was then called) passed through Bandel, a stone's throw away. The Hooghly, with its numerous flotillas of barges and steamers, almost touched the factory wall and only some two miles away lay

the Grand Trunk Road. Above all, it was located near enough to Calcutta, the industrial hub of the nation, but was not too near the congested area. It was an ideal choice for the progressive enterprise needing plenty of room for future expansion. From the 92 acres which Dunlop took over from the former occupants, the Dunlop estate today extends over 236 acres.

In July, 1936, the factory started production. It was a time of significant development in the economic life of India, and in this context of growing industrial activity, the founding of the Dunlop Factory served to meet an urgent national need.



Electric Cooking ranges ensure cleanliness in the Canteen Kitchen

It started with a complement of some 1,200 workers. Judged by present standards, this figure seems unimpressive, but in those days of recurring economic crisis it was considered a bold step to commence a new enterprise on such a scale. Today, the total number of workers employed in the factory is about 4,700.

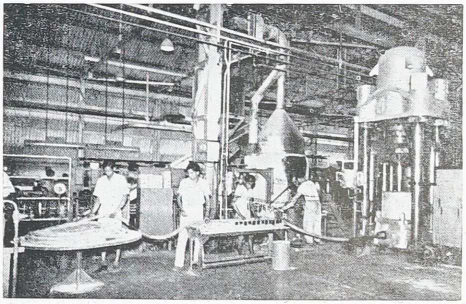
Every year new plant and machinery were added to augment the volume and range of production, so that by the beginning of World War II the annual output exceeded ten lakh tyres and tubes for cycles, and a further two lakhs for cars, trucks and buses.

When hostilities broke out in Europe in September, 1939, the Sehaganj factory had already attained a stature which marked out

A Giant tyre being removed from a mould after vulcanisation at the Dunlop Sahaganj Factory. Schemes are under way for increasing production of Giant tyres at Sahaganj. The new Dunlop Factory at Ambattur will also manufacture these tyres

for it an important place in the war effort in this part of the world. The entire production machine was changed to meet priority orders for Defence.

Aero tyres and tubes were added in 1940, to the range already being produced by the factory. Additional plant and equipment were installed and a considerable expansion in the output of tyres and tubes were recorded. In January 1943, the factory was bombed by Japanese raiders; 10 were killed and 20 injured but work continued in full swing and by V. E. Day, production of Sahaganj was four times the 1939 figure.



Dunlop were the first in India to commence the manufacture of long length braided hose by the lead press process at the Sahaganj Factory

New Lines of Production

With the end of the war, peace-time plans were resumed and installation of a cycle rim plant was completed; production commenced in 1946. The need for indigenous production of high quality rims was emphasised by the Tariff Board Report on the Bicycle Industry. With the growing use of bicycles in India, and the opening of new bicycle factories, the great utility of the Dunlop cycle rim-plant—employing the most advanced technique and equipment-was clearly established.

After Independence, the most momentous event in the economic and social life of India was the inauguration of the Five Year Plans. Agriculture, power, transport and heavy industry have received special importance and to each of these sectors Dunlop has an important contribution to make.

The recent extensions to the Dunlop Factory are of particular interest in relation to the Plan. With the large increase in power generation as foreseen in the Plan, transmission belting assumes vital importance. The belting plant was officially opened by Dr. B. C. Roy, Chief Minister of West Bengal, in December, 1952. The Dunlop Factory which is turning out rubber transmission belting of the best quality has thus eased the strain on foreign exchange resources.

The manufacture of Conveyor and Elevator Belting which are of particular importance to heavy industry, mining and for food storage purposes, are also now manufactured at Sahaganj. Dunlop now have a new Service Department in the Industrial Rubber Products field which is constantly at work investigating service conditions and studying technical queries. An adjunct of the Service Department is the Dunlop Conveyor Belt Splicing Mobile Team available to all users of Conveyor Belts in any part of the country. Dunlop were the first in India to manufacture long length braided hose by the lead press moulded process and a number of special types of quality hoses, hitherto imported, have been added to the range. Recently, Dunlop initiated an anti-corrosion and abrasion resistant rubber lining service which is of great importance to the heavy chemical manufacturing industry in the matter of storage and transportation of corrosive liquids.

Another event of importance was the production at the end of 1953 of tyres for jet aircraft, the first to be made in India, to meet the needs of the Indian Air Force.

Production of Dunlopillo Latex Foam cushioning, commenced at Sahaganj in 1951. Its increasing use on public transport vehicles, as also in cinemas, Assembly Houses and the home, promise a great future for this product.

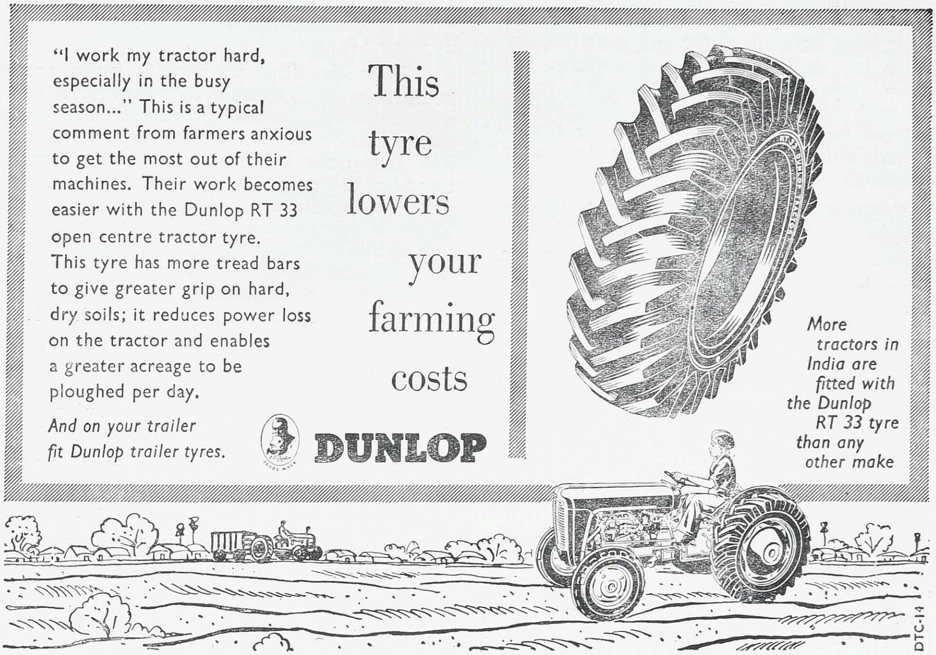
A recent development at Sahaganj is the plant for the manufacture of large earthmover tyres. This plant has now gone into production.

Thus is Dunlop enterprise serving the nation's economy—ever extending its range of activities so that today India can depend on her own resources for a large number of vital rubber manufactures.

Welfare Activities

Alongside the development in production, welfare amenities for workers and staff employed at the factory have been consistently enlarged and improved. The works occupy a mere 38 acres of the 236 acre estate, the rest being used for staff and operatives' quarters, hospital, schools, clubs, shops, gardens, roads, fire station and other amenities which go a long way toward making the Dunlop estate a self-contained civic community.

The Dunlop housing scheme is considered as one of the finest industrial housing projects in the country. A community of about 5,000 people, comprising of employees and their families, are now housed on the estate at nominal rents. There are altogether 1,130 operatives' quarters, of which 250 are for married operatives. Another 30 quarters are under construction and will be completed soon. In addition, there are 72 old type and 64 new type staff flats, while the construction of another 65 has now well advanced. Among other pro-



jects now under way is a market building which will improve shopping facilities for the residents of the estate. Improved street lighting is also being installed.

The factory hospital built and equipped at a cost of approximately Rs. 6 lakhs is unquestionably one of the finest industrial hospitals in the country. Apart from the general wards there is a female ward, a maternity section, a separate ward for patients requiring special attention and a segregated ward. The operating theatre is full equipped with up-to-date appliances and is air-conditioned. In addition, there is an X-Ray plant and an electrothorapy section with Ultru-Violet, Infra-Red and short and long wave Inductotherm apparatus. Special care is taken to provide patients with nutritive and balanced diets, while an ambulance, attached to the Factory Fire Brigade, is available for bringing in seriously ill patients to the hospital. It is staffed by six medical officers, six nurses and eight compounders and dressers. About 97% of the expenditure in the hospital is met by the Company.

An important aspect of health service offered at Sahaganj is the attention paid to preventive measures such as vaccination and inoculation and malaria control. In about fourteen years, malaria, the incidence of which was about 22% has all but disappeared from the estate. The Company spends over Rs. 36,000 a year on malaria control measurss.

Any account of the Dunlop estate would be incomplete without mention of some of the other amenities which contribute so much to the well-being of the residents. Schooling of employees' children living on the estate is a prime concern of the Company and about twelve years age, a primary school was started with 25 children. Later, it was brought up to middle English school standard. The number of young students increased so rapidly that today there are two schools with the medium of instruction in Bengali, and Hindi. On account of language difficulties, arrangements have been made for sending some children to the Convent school attached to the nearby Bandel Church, where education is imparted through English, and Hindi is taught as a secondary language. In the Bengali school there are 280 students reading under a teaching staff of 10, while there are

190 students and 5 teachers in the Hindi school. Some 200 children go outside the estate for Higher studies, for whom the Company provides transport. With the rapid growth in the numbers of students, the existing educational facilities are now proving inadequate and a new school building is under construction.

The factory canteen provides wholesome meals at subsidised prices. The canteen kitchen is equipped with electric cooking ranges which ensure cleanliness.

All forms of games and recreation are encouraged, for which the Company provides the neccssary grounds and buildings. The Dunlop Recreation Club has facilities for both indoor and outdoor games and sports. The highlight in this respect is the Annual Sports meet when not only the employees and their families, but men, women and children from miles around gather. Prizes valued at approximately Rs. 4,000 are distributed annually to successful contestants in games and sports.

The Club cinema arranges 10 shows a month, providing a mixed fare of English, Bengali and Hindi films. Twice or thrice a year the Dramatic Club also takes the stage at the Club House. These are some of the amenities which go to make the Dunlop estate an integrated township supporting a happy and healthy community.

Training of Personnel

Another notable feature of Dunlop enterprise in India is the steady progress made towards implementing the company's policy of entrusting to Indian personnel, positions of responsibility at all levels in the organisation.

As pioneers of a new industry, the Dunlop Factory was faced at the outset with the difficult task of finding experienced supervisory personnel. The solution to this problem was found by giving young men who had distinguished themselves in their work every facility of widening their experience and knowledge. In suitable instances, further training is arranged in associated factoriss abroad, particularly at Fort Dunlop, Birmingham, the largest and best equipped tyre plant in the Commonwealth. Many members of the staff have been sent abroad under this scheme, and a firm basis has thus been laid for an increasing proportion of the higher administrative and technical positions to be filled by qualified Indian nationals.

Since the first pneumatic tyres arrived in India in 1898 these sixty years have indeed witnessed spectacular progress. The Dunlop enterprise in India, it can justly be claimed, has not only kept pace with the growing needs of the nation's economy, but has also successfully anticipated future requirements. There is every reason to believe that Dunlop will continue to play their part in the years to come - years that will bring to a successful realisation the ambitions and far-reaching development plans on which the nation is now so firmly launched.

Expansion

The sixtieth year of Dunlop enterprise in India heralds a considerable expansion in capacity for the manufacture of tyres and tubes and other products.

The Second Five-Year Plan envisages that by 1961 the Nagpur Plan target for roads will in the main be achieved. During the Second Plan period Rs. 269 crores—nearly double the amount spent during the First Plan-will be expended on road development. The Planning Commission estimates that the number of trucks will rise by about 10,000 a year, and by 1961 there is likely to be a fleet strength of 160,000 trucks, as compared to 116,000 in 1956.

It is estimated that the consumption of automobile tyres in 1960 will be 16.2 lakhs as compared to a production figure of 9.2 lakhs in 1956; cycle tyre consumption is expected to reach 11 million as compared to 6.3 million produced in 1956.

Twenty-one years after the foundation of the first tyre factory in India, Dunlop have commenced construction of a second factory at Ambattur, near Madras. Work is proceeding fast and the Ambattur factory is likely to go into production by the end of 1958. The output of the Ambattur factory and the increased capacity at Sahaganj will enable Dunlop to produce tyres and tubes in increasing quantities to keep pace with the requirements of road transport in our fast developing economy. Industrial products and Dunlopillo will also be manufactured in increasing volume at the Sahaganj factory which can justly feel that it is pulling its weight in the national endeavour.

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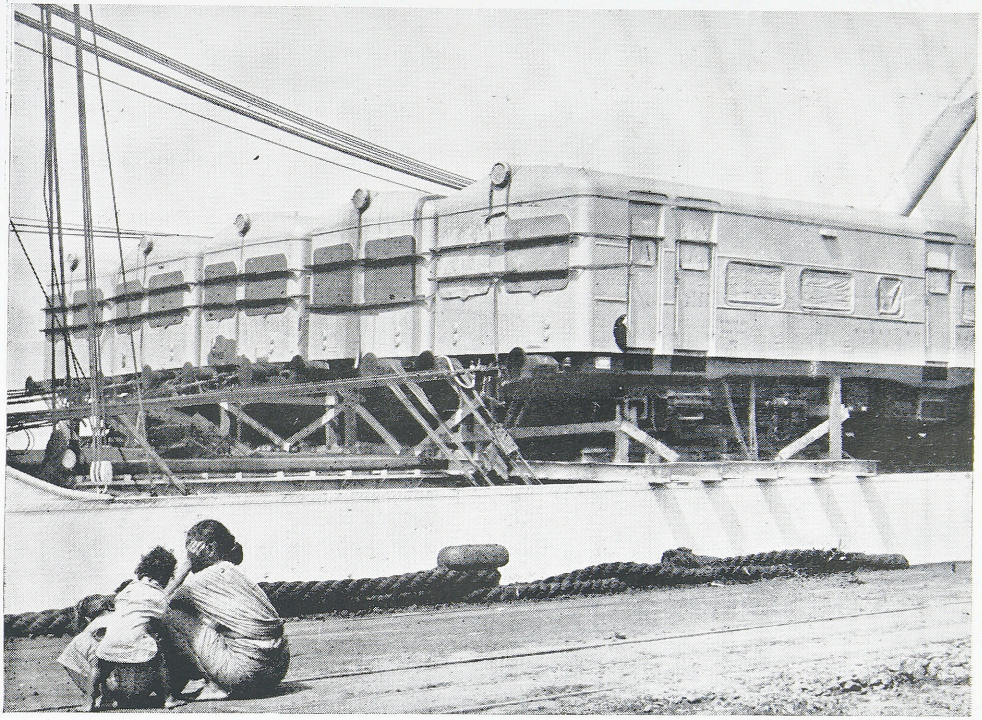
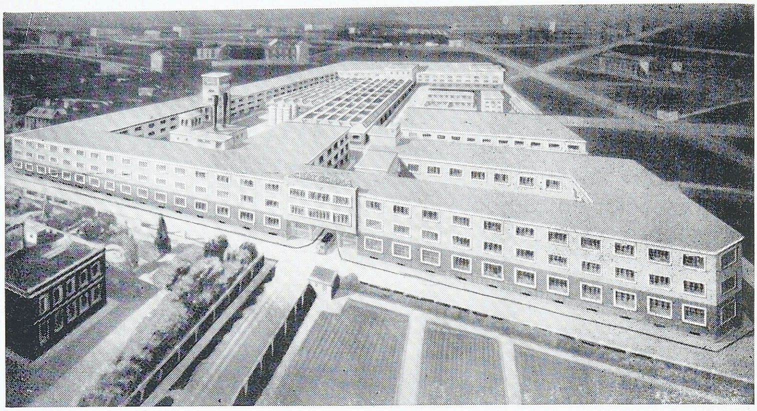
Diesel Rail Cars for India



Twelve Diesel rail cars for India's Southern Railway were unloaded in Madras recently. The Diesels were manufactured in Australia and are being supplied to India under the Colombo Plan

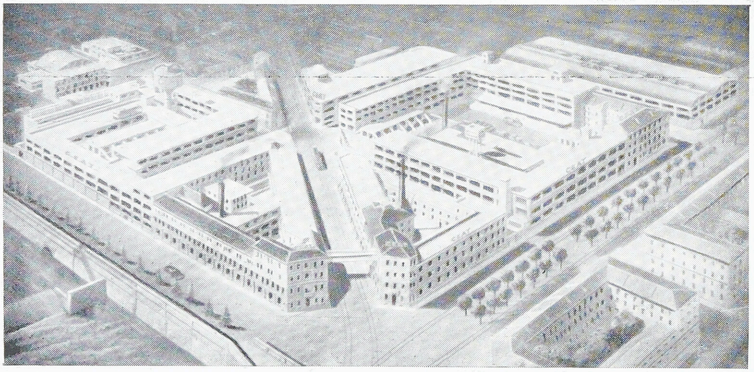


The Ceat Group in Italy

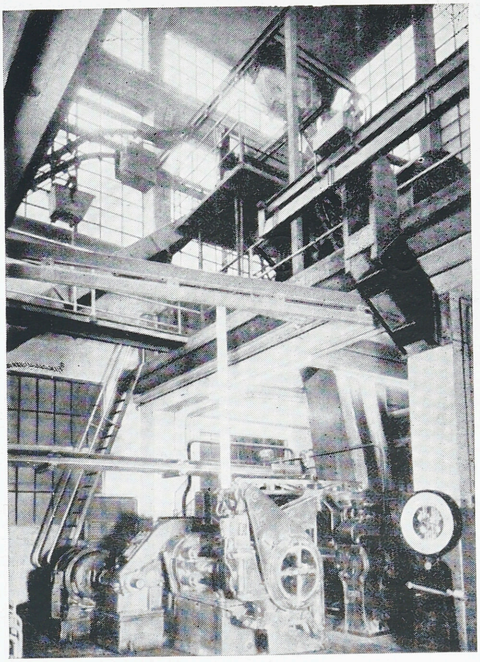
Indo-Italian technical collaboration will be further strengthened with the establishment of a factory near Bombay for the manufacture of rubber tyres. To be called the Ceat Tyres of India Ltd., the new company will be floated by Tata in collaboration with the Italian Industrial firm, Ceat S.p.A. of Turin.

The new company will have an authorized capital of Rs. 4 crores and a paid-up capital of Rs. 1.15 crores of which 60 per cent is to be subscribed by the Italian company and its associates, and 40 per cent by the public in India. This issue will be underwritten by the Investment Corporation of India Ltd.

In order to meet India's shortage of foreign exchange, the capital subscribed by Ceat and its associates will be in the from of supplies of plant, machinery and structures for the factory.



The Ceat Cable Factory, Turin



Plant for manufacture of rubber mixture

Cable ready for export

PLYWOOD PRODUCTS

Nineteen years ago at Sitapur, U. P. there was established a factory which laid the foundation for India's modern Plywood Industry.

The factory was primarily designed to produce Flush Doors and Blockboards from modern Synthetic Resins and most of the equipment was the first of its kind ever seen in India.

The factory was, however, not long in existence before the experts from the Forest Research Institute, Dehra Dun recognised its important potentialities for the production of Marine and Aircraft quality plywood and soon all the equipment and the energy of the management and technicians was diverted to the production of war materials.

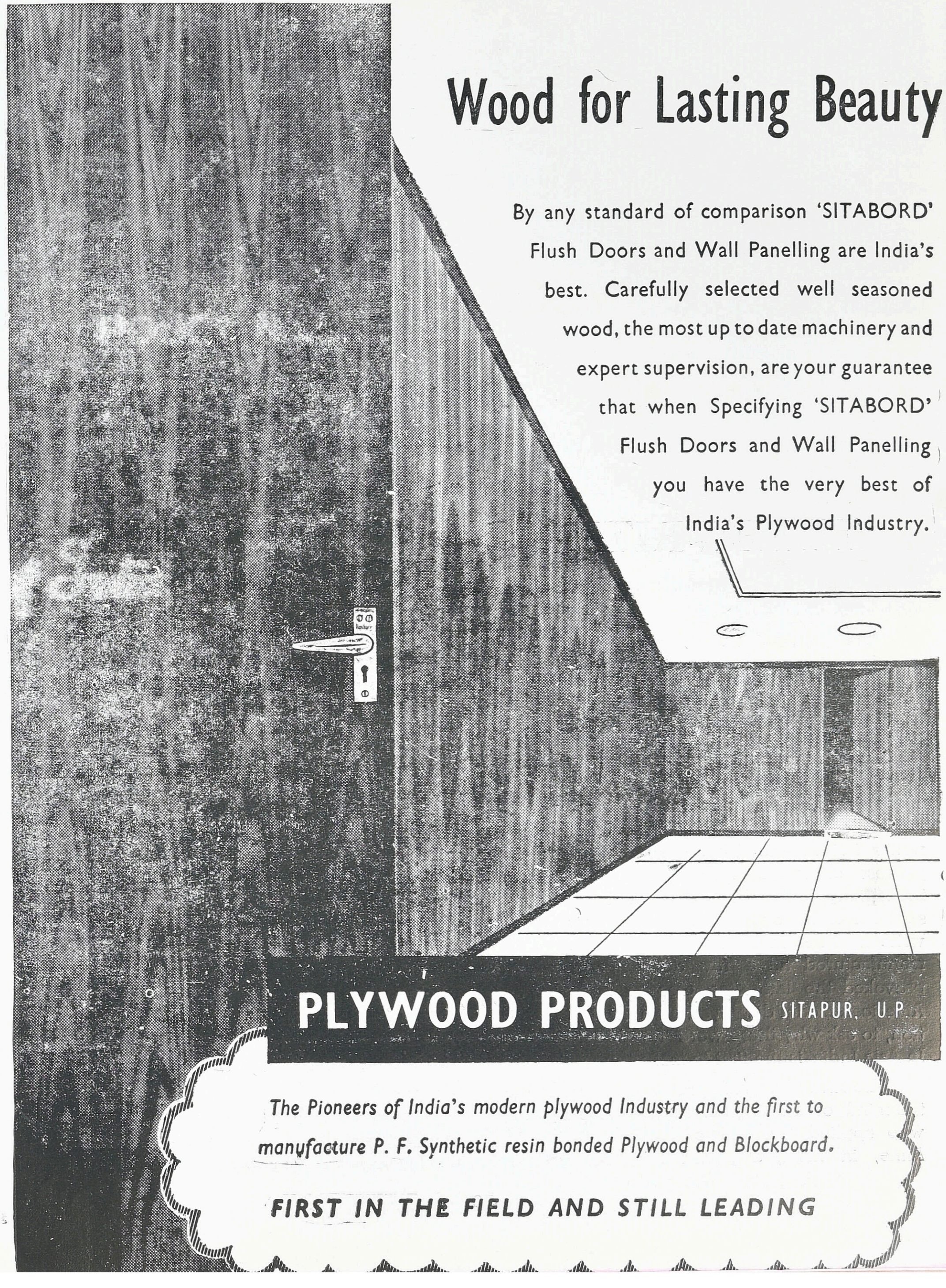
Before the war, Flush Doors were practically unknown in this country and by the end of the war little progress had been made in this direction. A few flush doors had been made and were installed in various buildings in which it was seen that the products of this factory could stand the test of time. Since the end of the war and especially since Independence "SITABORD" Flush Doors have come to be used in all the important public and private buildings in India.

Plywood Products, Sitapur also pioneered the production of high grade liquid Phenol Formaldehyde Synthetic Resin bonded decorative plywood which is now well known throughout this country under the name of "SITAPLY" which is a recognised synonym for high quality.

For many years this concern has been manufacturing laminates and moulded plywood sheets and recently a special Moulding Press has been installed which is believed to be the first of its type in any commercial establishment in India.

As a further contribution to India's expanding economy a department for the manufacture of high grade Synthetic Resin bonded Particle Board is being erected at Sitapur and is expected to come into production shortly. This will be India's first particle board manufacturing plant The board which will be marketed under the name of "SITAWOOD" will be utilized as core for "SITABORD" products, that is Flush Doors and Blockboards and will also be sold unveneered as a building or partitioning board. It is also expected that specially treated "SITAWOOD" Particle Board will shortly be available for concrete shuttering.

Although the words "SITABORD" and "SITAPLY" have come to connote high quality it will be appreciated that this does not necessarily mean high prices. The products of this factory are carefully inspected and controlled but enquiry will show that anyone may become the proud owner of "SITABORD" Flush Doors for a very modest outlay.


Wood for Lasting Beauty
By any standard of comparison 'SITABORD' Flush Doors and Wall Panelling are India's best. Carefully selected well seasoned wood, the most up to date machinery and expert supervision, are your guarantee that when Specifying 'SITABORD' Flush Doors and Wall Panelling you have the very best of India's Plywood Industry.
PLYWOOD PRODUCTS
SITAPUR, U.P.
The Pioneers of India's modern plywood Industry and the first to manufacture P. F. Synthetic resin bonded Plywood and Blockboard.
FIRST IN THE FIELD AND STILL LEADING

Mr. Karanjia, an excellent Journalist himself, traces the history of typewriter industry in his inimitable way.

TYPEWRITERS MADE IN INDIA

B. K. KARANJIA
Godrej & Boyce Mfg. Co. Ltd., Bombay

Much romance and adventure, more than a century of experimentation in several parts of the world, have gone into the truly international achievement which the modern typewriter is. Yet so highly specialised is its process of manufacture that even in the industrially advanced world of today, only seven or eight countries make their own typewriters. In Great Britain typewriters were not manufactured till a few decades ago, which provoked the late King George V, seeing an American model displayed at a British Exhibition, to ask why there were no British makes. In Asia India is the first to make typewriters.

The idea of a writing machine was born in the mind of an English engineer, Henry Mill, who applied for and obtained from Queen Anne, in 1714, a patent for "an artificial machine, enabling one to print or transcribe letters one after the other, just as when writing by hand...". One of the two basic principles of the modern typewriter, an assembly of bars with types, each type striking upon a common centre, was born in France in Xavier Projean's Ktypographic Machine or Pen. The other basic principle, longitudinal movement of a cylinder or platen to effect letter-spacing, was American being incorporated for the first time in a machine by Charles Thurber of Worcester, Mass. C. Latham Sholes, popularly known as the father of the typewriter and a citizen of Milwaukee, was actually fifty-second in a long line of typewriter inventors in five countries.

Today when typewriters are made in India in capacity sufficient to meet our requirements, it is ironic to reflect that but for the dogged-

ness of its pioneers the invention might never have seen the light of day. Its first inventor died before he could actually make a model. The only model built by the second inventor after the lapse of nearly a hundred years was destroyed by fire in the Washington Patent Office. Even when Sholes did actually market the world's first practical typewriter, its sales hardly bore out the prophesy in an advertisement in *The Nation*, New York, 1875 that the typewriter was " certain to become as indispensable in families as the sewing machine." The contemporary world remained strangely indifferent to it. Its price, 125 dollars was, for one thing, considered too high. For another, typewritten correspondence was thought to be insulting, casting an aspersion on the recipient's ability to read longhand! The typewriter was looked upon as an intruder on privacy: typewritten love-letters were, of course, taboo. Only 1200 machines were sold in the first seven years. The total proceeds from patents amounted to about 40,000 dollars so that Sholes died almost in penury.

The first typewriter did, however, excite interest in unexpected quarters. While on a lecture tour in Boston, Mark Twain saw it on display in a store and was so struck by its performance that he purchased it. In a letter dated December 9, 1874 written to his brother, he waxed eloquent on its several virtues. " ... I believe it will print faster than I can write. One may lean back in his chair and work it. It piles an awful stack of words on one page. It don't muss things or scatter ink blots around. Of course it saves paper...".

Twain's ' Life on the Mississippi', said to be the first typed manuscript ever to be submitted to a publisher, was typed in capital letters only for the good reason that his machine had no other. It was not till 1878 that the problem of two " faces " was solved, without increasing the number of keys, by placing two types, a capital and a small face of the same letter on each bar, and adding the shift-key. At about the same time, another typewriter was devised, containing twice the number of keys and, incredible as it may seem, it competed with the other model for a number of years. It was the touch system of typing with the all-finger action that decided the issue in favour of two faces on each key.

Typewriters are being tested

The typist today is able to see what he or she is typing. In early machines, the bars were arranged in a circular "basket", located underneath the carriage, which necessitated raising the carriage to see the typed lines. These machines operated on the down-stroke principle, in vogue till 1833. Front-stroke machines came several years later with type-bars placed in a segment in front of the carriage, the type printing on the front of the cylinder.

Manufacture of typewriters in India has further benefited by recent developments in the history of typewriting like the use of carbon paper, of the tabulator to adjust the typed matter in column from and of the convenient portable typewriter. If it is to keep abreast of world manufacture, manufacture in India will sooner or later have to tackle even more recent developments like the elimination of noise, once considered to be a necessary evil, and the substitution by electricity of the typist's labour.

The typewriter wrought a social revolution in the West. Keenly interested in the earliest practical typewriter was Shole's own daughter Lillian, probably the world's first woman typist. Her interest was symbolic, for the typewriter was soon to spell the doom of male clerks, hitherto laboriously copying letters in longhand in a copper-plate script at the maximum rate of 15 to 20 words a minute. The typewriter it was that opened the doors of business to women, creating a new profession for them, so that Sholes was right when he declared: "I feel I have done something for the woman who have always had to work so hard."

Long before the first typewriter was made in India, the wonderful writing machine effected a similar social revolution by initiating a flow of population to the East, West and North, to which the colonies of stenographers in Bombay and Calcutta and even in Delhi bear eloquent testimony!

So much has the typewriter come to be accepted as an indispensable adjunct of modern business and life that the highly skilled and specialised nature of its manufacture is seldom, if at all, realised. Typewriter assembly involves about 5,000 distinct operations; its components number over 1,800, machined sometimes to tolerances of less than seven-tenths of a thousand of an inch; the screws alone are of 150 varieties, with special threads. Steel, iron, aluminium, brass rubber, plastic and many other materials go into its making.

Manufacture becomes more complicated, as in the case of an otherwise industrially advanced country like Japan, by the character of typography. India has successfully solved the difficulty presented by the 'matras' and half characters of Hindi and the regional languages by the keyboard innovation of half-movement keys, which causes the carriage to make only half its normal movement, and thus ensures proportionate spacing.

The experience, resources and persevering power that typewriter manufacture calls for can be gauged from the fact that even in an industrially advanced country like America where the demand is the biggest in the world, estimated at many hundreds of thousands annually, only five makes survive out of a total of 228 makers (the world total being 429).

As against this, the demand in India is small. Basing its estimate on import figures of the last five years, which reached their peak at 20,875, the Government of India has sanctioned a total capacity of 33,000 typewriters a year, manufacture beginning with a pioneering steel-fabricating firm in Bombay and followed up by firms in Madras and Calcutta. No State protection has been asked for in manufacture.

The reasonable price of the all-Indian typewriter will no doubt cause this demand to grow and bring this wonderful writing machine within the reach of larger numbers. This in turn will give increasing support to a host of ancillary industries, like ribbon and carban paper, erasers and ink-eradicators, typist's chairs and tables—one sign, among many, of India's coming into age, industrially speaking.

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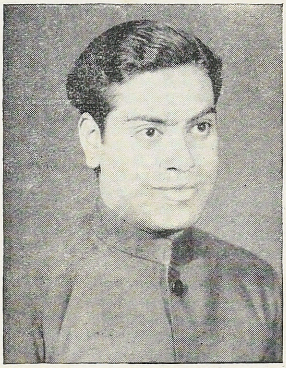


India throws out magic casements to tourists from all parts of the world and great is the future of this nascent industry.

TOURISM AS AN INDUSTRY

S. VEDANTAM

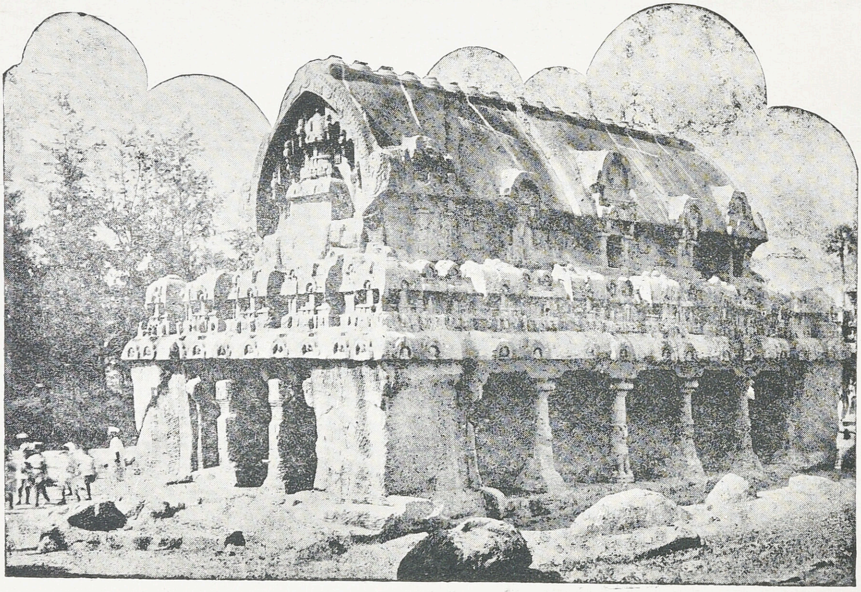
Public Relations Office, Southern Railway

Till 1948 Tourism in India consisted of isolated efforts on the part of Railways and a few travel agents, but to-day, it has almost assumed the status of a social movement with unique potentialities of acting as a powerful means of developing social contacts and better understanding among the peoples of the world. It has in fact become a large scale industry.

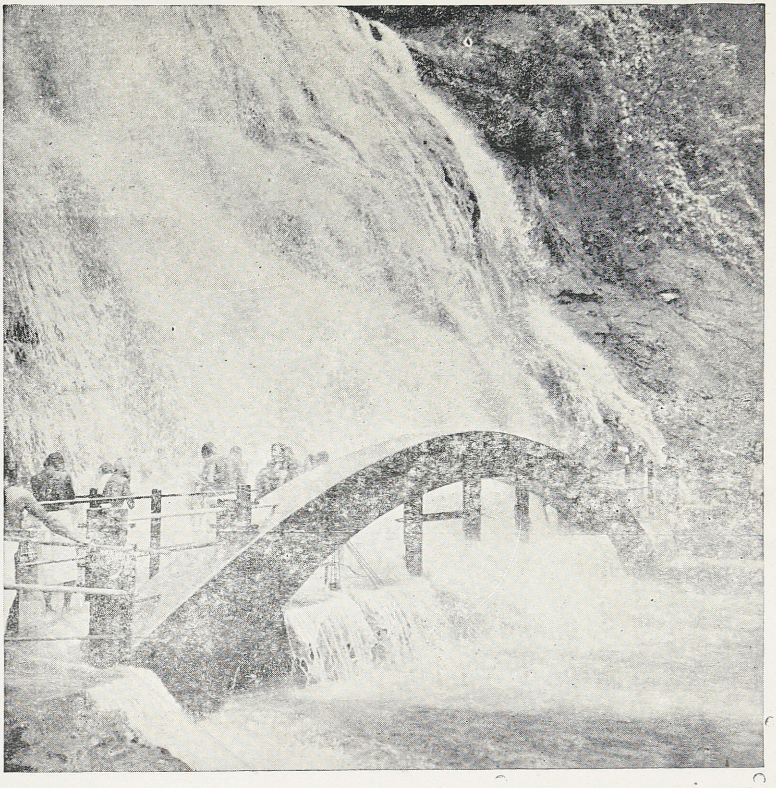
To the foreigner also, India presents a fine spectacle. It is the land with a wondrous heritage and glorious tradition, combined with all the charm mysticism of the orient. Travel in this country is therefore equally attractive to both the Indian and the foreign tourist.

A feeling is sometimes engendered that a foreign tourist is more welcome than one of us. Perhaps it is because of our traditional hospitality that we put others before ourselves. In its purely commercial aspect, the overseas visitor helps in the adventitious accumulation of foreign exchange which is an especially important consideration today. But that, of course, is not the sole and perhaps also not the over-riding consideration for promotion of visits to India by foreign tourists. Tourism today has a significant place in the culture and economic progress of a country. Apart from it being one of the best foreign exchange earners, it gives an opportunity for those from outside to see and know the real India and thereby remove the many misconceptions about this country created by colonial powers. In ancient days India was at the top of the world in civilisation, culture, philosophy etc. and our emissories went out to the four corners of the world,

spreading our message of peace and self renunciation. The fame of our fabulous country had spread throughout the world so that India was the dream-land for many explorers, philosophers, traders and also for conquerors. It is worthwhile to remember here that America, the most modern and the richest country of the present world was only a by-product of the search for India by Colombus. But India during the colonial rule had fallen from those high pedestals. Our conquerers wanted purposely to make India a "backward country" to justify their "divine right" to be here to "develop us towards good government" and hence fed the world with Miss Mayo's "Mother India" type of literature, depicting India as a jungle country of black magic and rope tricks, Deva Dasees and turbaned Maharajahs whose only function in statecraft seemed to be exploring the subtleties of feminine varieties. With the advent of our Independence and raising of our international status through the leadership of our great Prime Minister, things have changed a lot, but even now the commonman in those countries has not changed the misconceptions he had. These foreign tourists who come out to our country are therefore our real ambassadors who will go back and tell their people what real India is. They should therefore be treated as our national guests and our traditional hospitality should be extended to them in providing all the facilities they reguire. Every foreign tourist to India must be looked upon as a harbinger of goodwill which will develop between his country and ours when he returns and spreads among his family and his friends a wider, deeper and more intimate knowledge of India, her people and her glorious past which he will have acquired during his tour of India. He will have, doubtless visited those repositories of India's ancient culture, her monuments, her temples and her sculptures, all of which will leave an unforgettable impression on his mind.



This Monument needs only a glass case.

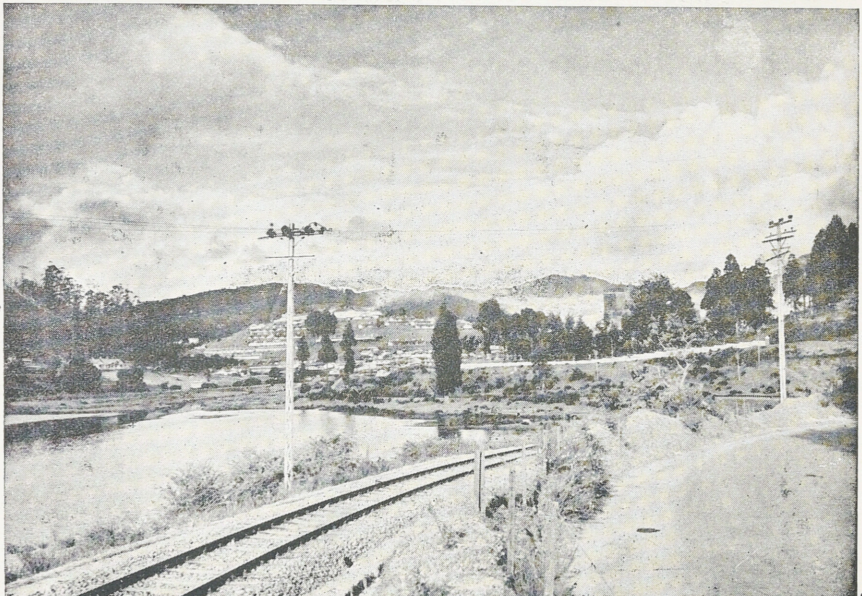


The sounding cataract haunts us like passion

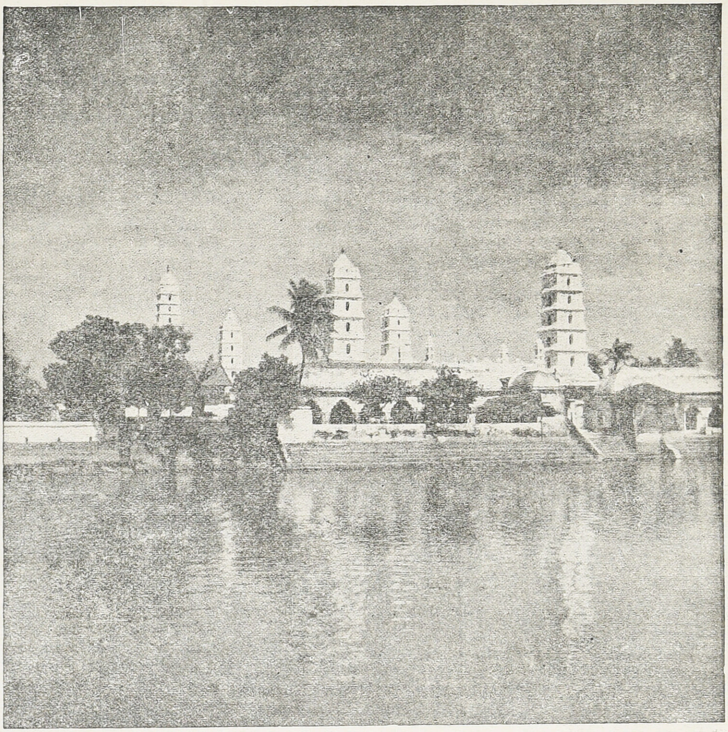
The potentiality of India for augmentation of her foreign exchange earnings from the development of tourism is enormous and unlimited. Tourists from foreign countries had accounted for the earning of Rs. 15 crores of foreign exchange during the past year, as opposed only Rs. 2.5 crores a few years ago, when the facilities for visiting places of interest were far less than now. The tourist division of the Transport Ministry is to be congratulated for the considerable extent and importance with which India has been put on the tourist map of the world. The basic facts about tourism in India are by now fairly well known; the tourist traffic to India has been increasing at the rate of 20 to 25 percent every year, that the increase in traffic from the U. S. A. is proportionately higher than from other countries. Its importance as an earner of foreign exchange is being increasingly recognised. The Government of India have since 1950 taken many steps in the development of tourism. A Tourist Development Council has been set up to achieve effective co-ordination and co-operation of all the interests, official and non-official, in the promotion of tourism. To-day, there are seven overseas tourist information centres in New York, San Francisco, London, Paris, Frankfurt, Melbourne, and Colombo; and fifteen information offices spread over in the

various parts of the country. The foreign offices have been set up primarily with a view to publicise India abroad as a tourist centre. The offices in India act as the liaison between the foreign tourist and the country. They collect and disseminate tourist information; suggest and recommend to all those concerned with the tourist trade, every form of tourist facility which will make the tourist visiting the country happy and comfortable. Publicity abroad and providing information to tourists on arrival here still continues to be one of the most important functions of the Tourist Organisations. The total number of foreigners visiting our country today is the highest on record so far, 68,880 in 1956—57 as compared to some 20,000 in 1950—51. The largest number of visitors this year is from the United States of America, 15,111, while those from England number some 13,000. It is sincerely hoped that the tourist traffic from America will increase even more in the coming years, and our dollar earnings considerably enhanced.

The standard of living of the foreign tourist who comes to India is naturally high, as he would generally belong to a more affluent class, considering the distance he has come and the time and money he has spent to see our country and to know our people. The catering to such tourists would, therefore, give rise to facilities of a high standard at out important tourist centres. Regarding Hotels in India which is perhaps one of the most important aspects of the Tourist industry, the Estimates Committee in their Report have recommended the forming of a Hotel Consultative Committee to tackle on a nation-wide basis the various problems to be solved by the Hotel industry in India. As we all know, if high



The aching joys and giddy raptures of Ooty



The magnificent Mosque at Nagore

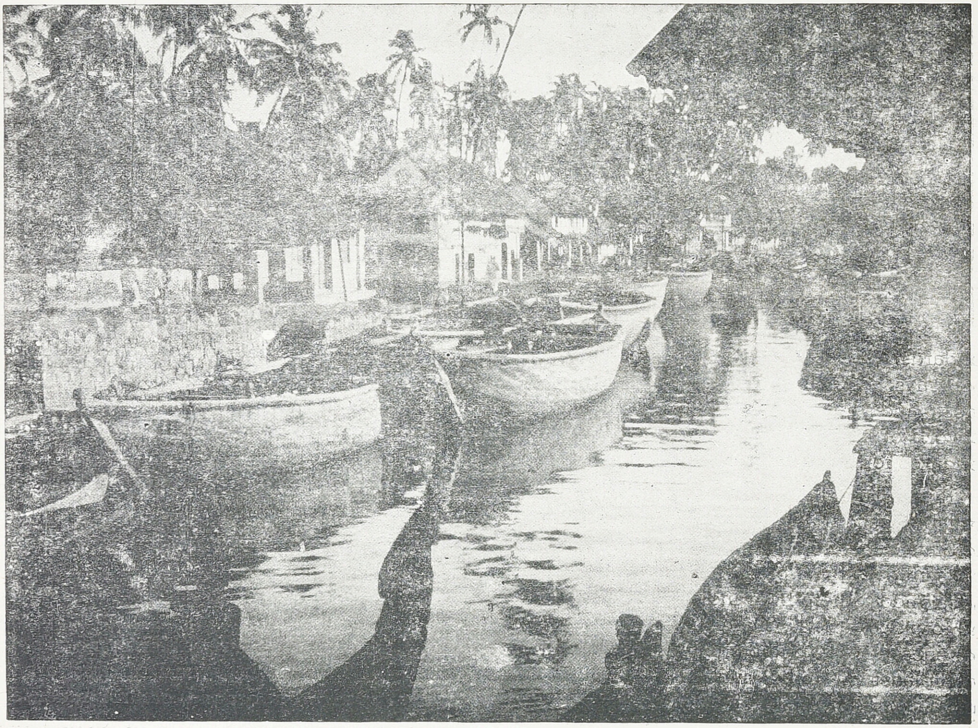
standards are set in certain places, the tendency is always to emulate the example in other places and thereby we will be spreading a network of facilities with higher and better standards for our own tourists.

Rupee Travellers' Cheques have been made available at the Indian and foreign offices of the State Bank of India and their corresponding banks all over the world. The scheme which is designed to help both Indian tourists abroad and foreign tourists visiting India, provides for the encashment of the cheques at out of the way places in India, such as at hill stations, festivals and fairs, and outside banking hours. It is believed that foreign tourists visiting this country often preferred to convert a part of their travel funds into rupees and would not only do so but would be inclined to spend more, provided they knew they could get excess rupee funds converted back into their own currency when they departed.

The Hind Flying Club of Lucknow is reported to be making arrangements for air taxi travel between Lucknow, Allahabad, Kanpur and Banaras to meet the growing demand for fast short-distance air-travel. The scheme will be of special interest to the organisers of tourist itineraries. The international airports at Bombay, Delhi, Calcutta and Madras are to be equipped with ground control radar apparatus ensuring safer operation during bad weather.

HOME TOURISM: Home tourism also has a great importance. India is a vast country and it is only tourism that could maintain the solidarity of the entire India under one Central Government by preventing all fissiparous tendencies and regional prejudices which will eventually lead to the disintegration of the country and hence it is absolutely necessary to encourage social contacts among people of the various parts of the country.

Internal tourism has several important aspects. For a country like ours, which has been emancipated recently after a century and a half of enforced foreign rule, national pride and humour must be awakened. Visits to monuments of old will provide a realistic awakening to the glories of our ancestors and thereby foster national pride and dignity. It will stimulate the revival of the spirit that inspired the creators of those wonderful monuments and this must inevitably lead to an advancement in our present standards all round. The second important aspect is the recreational and educative side. There is perhaps no better and more effective a medium of education than travel. It is through contacts with people of the different parts of the country, getting to know their ways and customs and appreciating and understanding their way of thinking that more tolerance of one another will be brought about. And as we all know the education that comes of travel is perhaps the finest of all. In its third aspect tourism, as a full-fledged industry, will bring



Malabar, the land of enchantments

prosperity to such trades as the Hoteliers, the Restauranters and those who provide transport, that is the railways, the airways and automobile industry. It will give employment to several people. In Italy, France and Switzerland, tourism is a major industry which is earning for each those countries between 200 and 400 crores of rupees annually by way of foreign exchange from external tourism.

The Indian Airlines Corporation and the Indian Railways have contributed a great deal towards the development of tourism in India for rail and air communications have brought the various tourist centres in India within easy reach of the tourist. Good food and a comfortable lodging are the prerequisites if tourism is to be promoted. The accent on hotels in the development of tourism cannot be over-emphasised. Hotels together with travel agents and transport constitute the major pillars. As for tourist agents, a few agents in India have achieved considerable success in establishing themselves as all-round service agencies for encouraging and promoting travel and tourism both in India and abroad. A 'Conducted Tour' offered to the tourist will be of immense help if enough time for pleasure, shopping and some times even free days to attend to his personal engagements or business appointments is also provided in the places he is staying. The Central Government has also a programme to provide an adequate number of trained guides so that the country's culture and heritage are interpreted correctly to the tourist.

The limited means at the disposal of the great majority of our people makes an expensive holiday the privilege of a few. But train travel in India is cheap and economical, boarding and lodging facilities are developing around the centres of tourist attraction making them more attractive to the intending tourist. People are getting more holiday minded and with the development facilities India will be a happy hunting ground for the tourist. With an

IT IS FOR YOUR GOOD!

It is not Safe to walk across the Rails as a Short-Cut. It may cost your Life. Make use of over-bridges to get across.

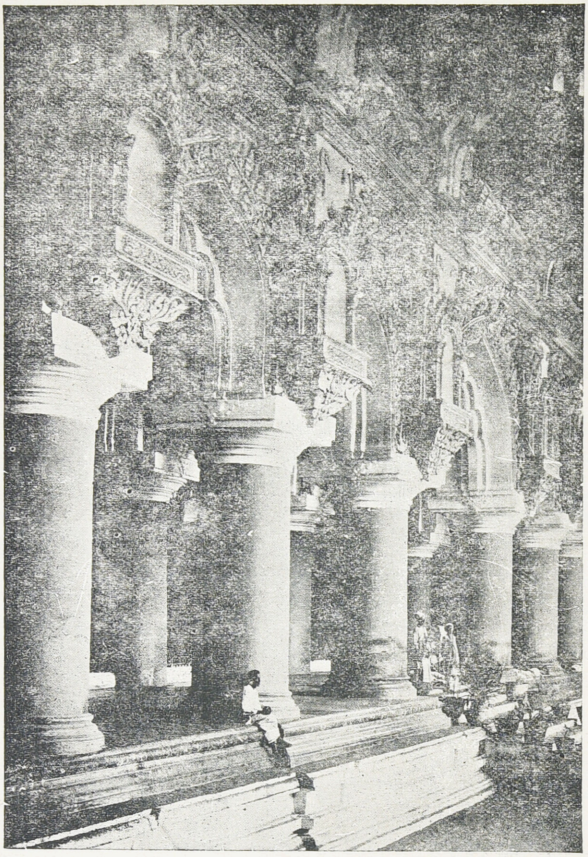
If you Travel Light you will feel Comfortable and make your fellow passengers also feel the same.

Station Surroundings will remain clean if all unwanted things are thrown into rubbish bins provided for the purpose.

Do not risk your life by travelling on the Foot Boards. It is not only dangerous but also an offence under the Indian Railways Act.

Beggars and Hawkers besides indulging in Ticketless Travels add to over crowding. Discourage them as best you can.

ISSUED BY
SOUTHERN RAILWAY



Poems in stones at Madurai

endless round of attractions that range from cool bracing hill stations, salubrious seasides, wild and woody hills and calm and placid backwaters, to centres which are repositories of our ancient culture with monuments of a glorious past and pilgrim centres, the future of tourism in India is assured. We are blessed with many such tourist attractions to cater to all kinds of tastes. Let us make the best use of our rich heritage, and make tourism a full-fledged national industry.

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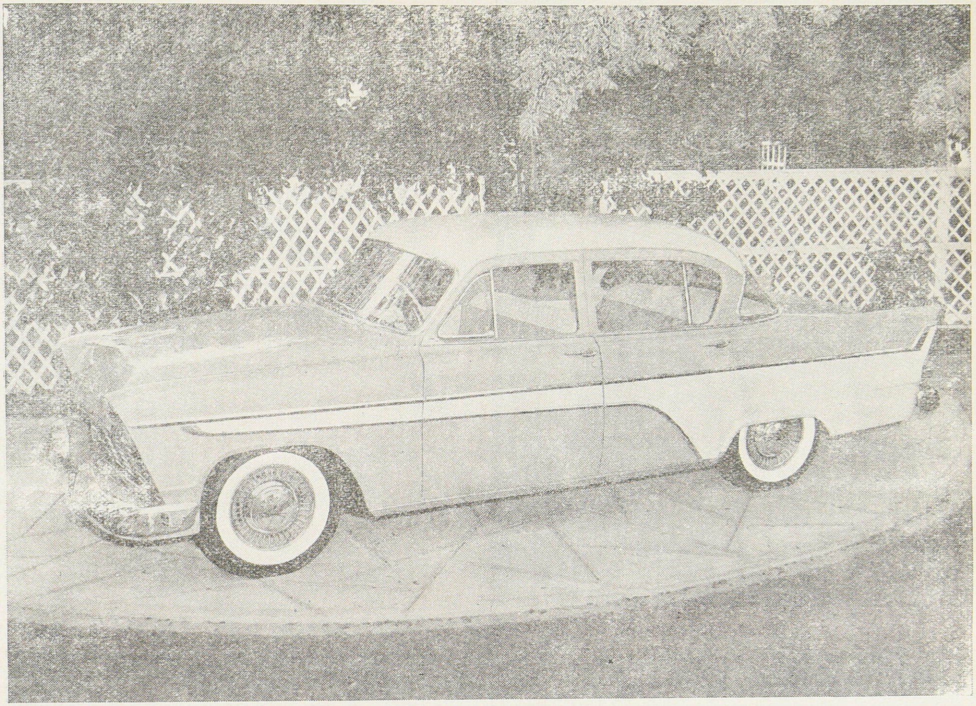
INDUSTRIES PRESS

MADRAS - 17



The demand for automobiles in India has been steadily going up since 1954. As against 14,000 vehicles in 1954, 30,000 vehicles were sold in 1956. This production is divided among the Six manufacturers. By the end of the Second plan (1960-61) the demand will rise to 57,000 vehicles, as against Tariff Commission's estimate of 65,000 vehicles comprising 40,000 commercial vehicles, 20,000 cars and 5,000 jeep-type vehicles. With the fast development of Road Transport, we will need more vehicles

In more than 70 free nations, spanning half the globe, Caltex supplies fine fuels and lubricants to industry, transportation, agriculture and to motoring millions. Caltex continues to invest its funds, skills and resources in such nations as these, for it is only the bold vision of today that sees the bright picture of tomorrow

Repco is Australia's largest manufacturer of automotive spare parts and equipment for the reconditioning and servicing of motor vehicles

Centuries ago ships from the South touched the shores of forlorn seas. Now the glory of the past is being revived.

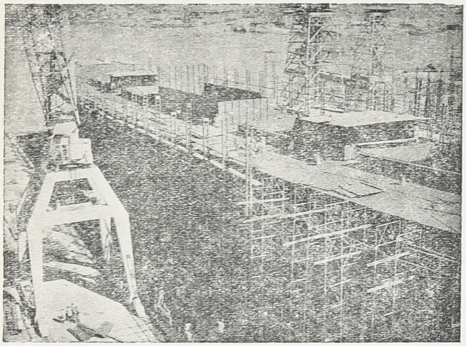
SHIP BUILDING INDUSTRY

The only major shipbuilding yard in India is situated at Visakhapatnam, which has got a fine natural harbour.

The idea of establishing a modern shipbuilding yard in India was conceived by the late Shri Walchand Hirachand, a man of great vision in pioneering key industries. Accordingly The Scindia Steam Navigation Co. Ltd., of which he was the Chairman, succeeded in starting the shipyard in 1941 after overcoming a series of initial difficulties.

The foundation stone of the Shipyard at Visakhapatnam was laid in June 1941 by Dr. Rajendra Prasad, who was then the President of the Indian National Congress. The original scheme envisaged an area of 56 acres and the provision of eight slipways on which ships could be built and adequate workshops and jettys to serve them.

The construction of the Shipyard by the Scindia Company was executed during the peak years of the War, when the Company had to contend with numerous difficulties like shortage of materials, equipment and skilled labour which presisted throughout. Nevertheless, the first stage of the construction of the shipyard was well under way in 1942. But the unfortunate air raids of Visakhapatnam Port by the Japanese in April 1942, which resulted in the closure of all activities at Visakhapatnam, gave a serious setback to the completion of the project. Towards the end of 1942 the construction of the shipyard was resumed in Visakhapatnam in small stages. The first stage of con-



A Ship under construction

struction of the shipyard, with two slipways and attendant workshops was completed in 1946.

The keel for the first ocean-going steamship of 8000 tons in deadweight was laid in June 1946 and this vessel was launched and christened as "Jalausha" in March 1948 by the Prime Minister, Pandit Jawaharlal Nehru. In the following years upto 1952, the Shipyard built 8 more ships of the same series.

With the advent of independence it became an important part of Government's policy that nation building industries and projects should be established in the public sector. In accordance with this policy and on account of the uneconomic nature of shipbuilding industry for private enterprise to develop, the Government of India took over the shipyard at Visakhapatnam in March 1952. The Shipyard is now owned and operated by a Government controlled company, Hindustan Shipyard Private Ltd., in which about nearly 80 per cent of the capital is held by the Government of India and remainder by the Scindia Steam Navigation Co., Ltd., Bombay, who founded the Shipyard.

The Shipyard, which occupies a total area of about 72 acres, is now equipped with four large-sized slipways, on which ships upto 550 ft. in length and 15,000 tons in deadweight could be built, and a Fitting-out Wharf 1,200 ft. long with a heavy lift fixed crane of 125 ton capacity, a large Mould Loft Floor, a Hull shop, a Machine Shop, a Smithy, a Foundry, a Plumbing Shop, a Sawmill and Carpentry shop, an Electric Sub station, a Stores Building, Steelyards, and various other small units necessary for shipbuilding, apart from commodious buildings for the administrative and Drawing Offices.

A housing Colony designed in accordance with modern principles to town planning nnd extending over an area of 145 acres, has also been constructed. Approximately 1500 employees of the Shipyard live in this colony. About 400 more houses have recently been added in the colony for the employees. The colony is provided with parks, schools and a Dispensary. There is also an auditorium for exhibiting films and enacting plays.

The Shipyard has adequate technical staff, some of whom have been trained in different branches of shipbuilding in foreign shipyards in U. K. and France. About 5,000 persons are now employed in the Shipyard at present including officers. The total subscribed and paid-up capital of the Shipyard is now 5.06 crores.

As an adjunct to the Shipyard, a project for the construction of a Drydock capable of accommodating large ocean going ships (for examining and repairing the bottom under-water portion of the hull) has also been sanctioned by the Government of India at an estimated cost of Rs. 2.15 crores. The Drydock, on which preparatory work is now on hand, is expected to be completed by the end of 1959. Due to the recent foreign difficulties, the Drydock project is likely to be delayed.

So far, the Shipyard has built nineteen ships, twelve of which are steamships of 8000 deadweight tons each, four being diesel ships of 7000 tons deadweight of modern design, two more modern diesel vessels of 8000 tons deadweight and a passenger-cum-cargo vessel. The quality of the work turned out in the Shipyard has received uniform approbation from experts and all the ships have been built to the highest classification of Lloyd's.

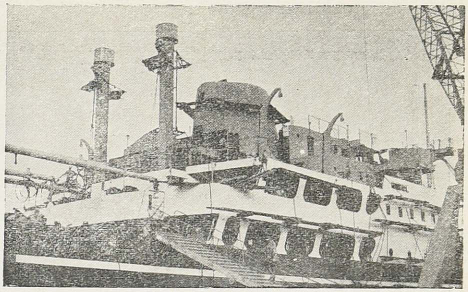
Though the Shipyard has got facilities to build vessels upto 12,000 DWT, most of the

ships built so far are of the sizes varying from 5,000 to 9,000 tons. At present, depending upon the type of ship it takes 9 to 11 months to launch a ship from the time the keel is laid and a further 6 to 9 months to fit the engines, auxiliaries, and various items of equipment, furnishings, etc. Thus normally a ship is delivered in about 15 to 18 months' time from the time the keel is laid.

At present about 20 to 30 per cent of the materials consumed in the construction of a ship are of indigenous origin. This and the cost of a ship, the balance representing the foreign exchange element. In the Second Plan, provision has been made for manufacturing engines and auxiliaries, so that the Indian shipbuilding industry can become self-sufficient in due course without having to rely on imports.

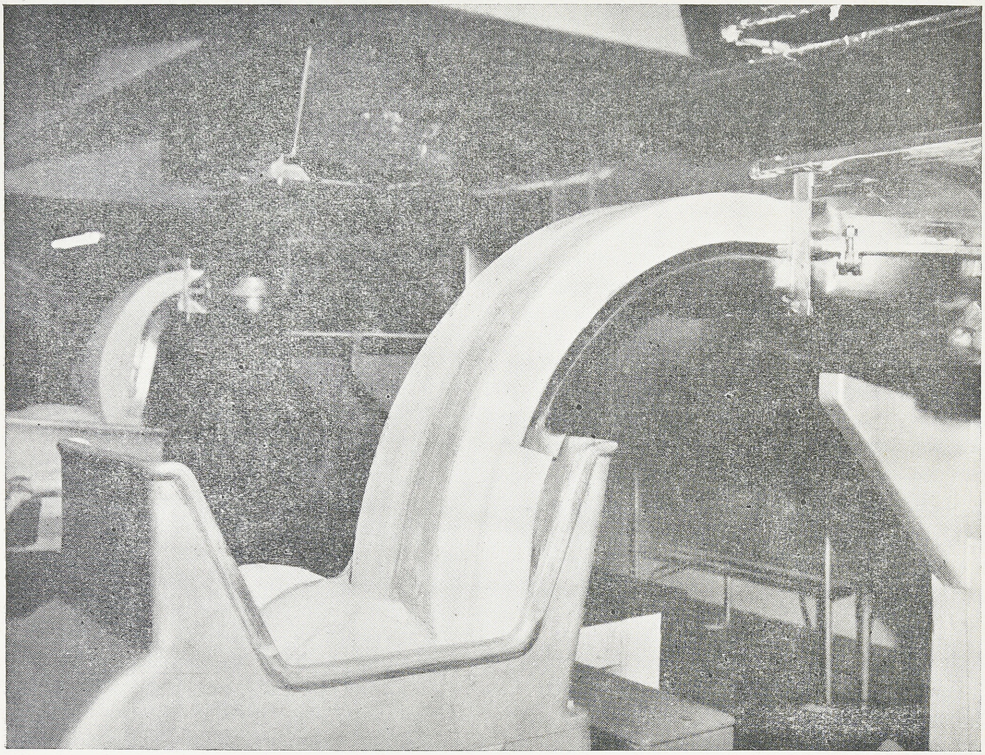
According to the Development Programme now under execution, the capacity of the Yard is being expanded to achieve a production of about 4 ships (aggregating about 40,000 dwt.) per year as against the present output of 2.1/2 ships or about 25,000 DWT. in a year.

The national and strategic importance of the industry has been recognised by the Government of India who have recently decided in principle to set up a second shipyard in the country. Steps are already being taken to train the personnel likely to be required to man the second Shipyard, which is expected to be the principal bottleneck.



A Ship under fitting at the Jetty

Although modern shipbuilding has been comparatively new to India, our country had been producing ships of fairly high standards as early as the 11th Century A.D. It is thus only a question of reviving an industry which had become defunct due to the ravages of time. We have already achieved a fair measure of success in establishing a modern shipbuilding yard in India and can look forward with confidence to the development of the industry to its full stature before long.



A new factory, recently opened in Melbourne, vacuum processes and automatically packages butter, under controlled temperature and humidity conditions. At no stage is the butter touched by hand. After blending the butter is extruded mechanically in a continuous ribbon to automatic wrapping machines

INDUSTRIAL EXHIBITION OF PLASTICS

At a recent exhibition organized by the All India Plastics Manufacturers Association, held at the Cowasjee Jehangir Hall, Bombay, many new plastic products were on display. The Exhibition was the sixth of its kind to be organized and it is significant that the number of exhibitors had increased from seventeen in the first year to thirty in this last.

The Plastic Industry is still comparatively young in India, and the objective of the Association to introduce and popularise plastics with the general public couples a dual purpose of information. Many hundreds of visitors have been surprised to see the innumerable forms and applications for plastics.

Plastics were conceived originally as substitute materials only, but they are now increasingly preferred in both domestic and industrial applications. The advantages of plastic products compare very favourably with products made from traditional materials. The new synthetics are light in weight, fast to mould, fabricate or install. They are also easy to clean.

Of great interest to the many visitors from both inside and outside the trade was a new foamed synthetic based on polystyrene, manufactured and marketed in India under the trademark, Thermocole. This product is manufactured from start to finish by R. A. Cole Private Ltd., of Bombay, who claim for the new product unique properties.

Thermocole is a snow-white rigid foam, composed of tightly packed air cells, the walls of which form the structure of the mass. The material has unique insulation properties, and combines lightness of weight with structural strength. At a density of one pound per cubic foot, Thermocole is sixty times lighter than water and seven to eight times lighter than cork. Despite this lightweight, Thermocole has a high compressive strength of one ton per square foot. Thermocole is available in a variety of sheet sizes and thicknesses and can be easily cut to suit all requirements. It is supplied by the manufacturer in white (its natural colour) or in a variety of processed shades. Alternatively the white sheets can be painted in any colour by ordinary emulsion paint or distemper.

In cold insulation Thermocole has been used extensively. Some well known establishments to use it include Century Rayon, Travancore Rayon and Gwalior Rayon, while cold stores both in Northern and Southern India have been lined with the material. Due to

A garden sprinkler, driven by a tiny turbine, will water square or oblong areas without drenching Surrounding paths, has been developed by an Australian company

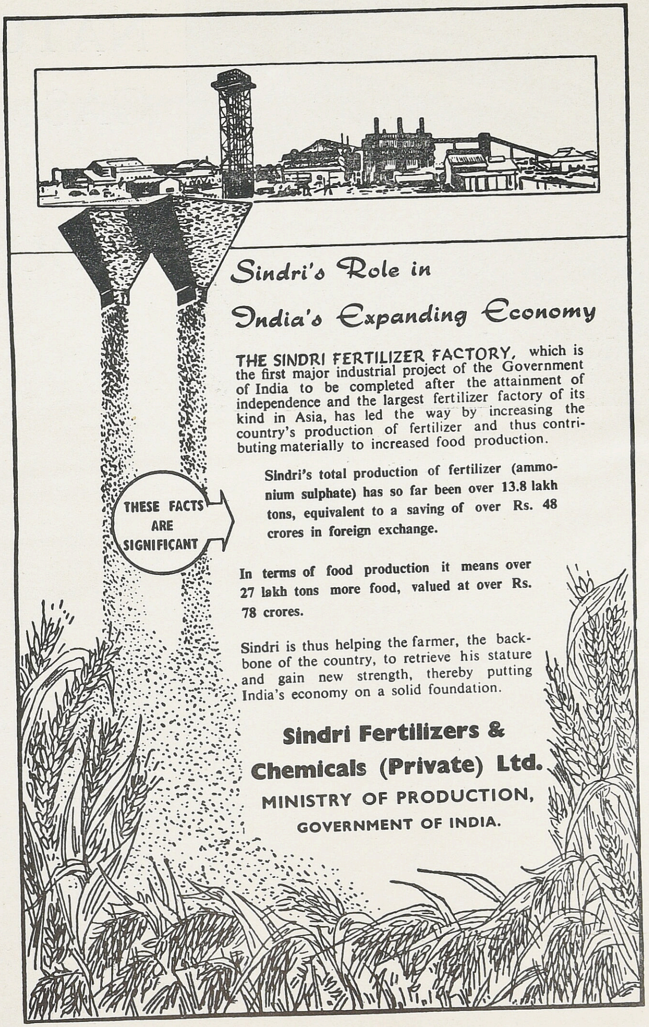
its non-absorbancy, Thermocole does not detoriorate when used in cold stores as does cork and some other traditional insulation products. The insulation efficiency of Thermocole is one-third more than that of cork.

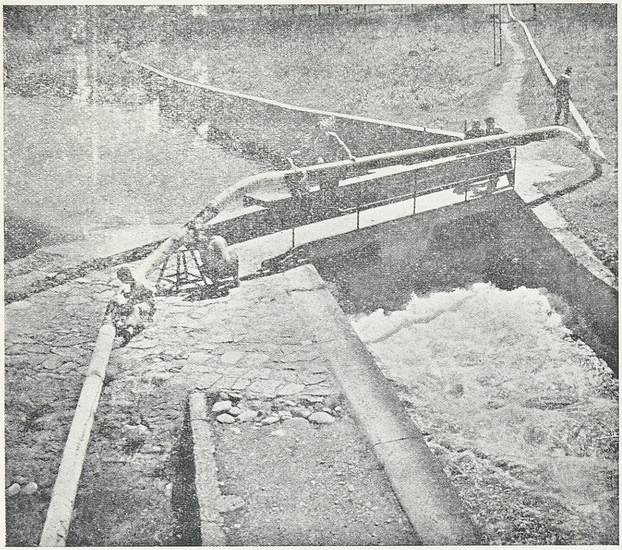
Thermocole is used extensively as a building material both for combined insulation and waterproofing of roofs as well as for partitioning of rooms. Roof insulation is of particular importance in tropical countries and recent experiments carried out by Shalimar Tar Products (1935) Private Ltd., on their prestressed roofs gave excellent results. It was found that the fall in temperature in a room insulated with ½" Thermocole slabs was as much as 12°F.

Thermocole building boards can be lined with veneered ply-wood facing, while ordinary Thermocole sheets are used as a substitute for cane fibre boards. Of particular interest is a Thermocole product sold under the trade name, Muffeltone. This is an acoustical tile possessing in addition all the basic qualities of Thermocole. It not only meets the requirements of the small, air conditioned room; its sound-proof properties are especially suited to the auditorium or any large office or factory space in which noise reverberation is a problem. Muffeltone is of particular benefit in the home or office where it reduces sharp noises emitted by the airconditioner and, even where the room is not itself airconditioned, it reduces echo and reverberation from surrounding rooms. The natural insulation properties of the product also guarantee a considerable reduction in room temperature.

The non-absorbant and buoyant properties of Thermocole extends its usefulness to marine appliances. Thermocole life buoys, life jackets and fishing floats are now used all over the country. The introduction of Thermocole fishing floats particularly has considerably helped the fishing industry throughout the coastal areas.

As a packing material, Thermocole is now being developed and it is anticipated that there will be a considerable demand for this new product.


Sindri's Role in
India's Expanding Economy
THE SINDRI FERTILIZER FACTORY, which is the first major industrial project of the Government of India to be completed after the attainment of independence and the largest fertilizer factory of its kind in Asia, has led the way by increasing the country's production of fertilizer and thus contributing materially to increased food production.
THESE FACTS ARE SIGNIFICANT
Sindri's total production of fertilizer (ammonium sulphate) has so far been over 13.8 lakh tons, equivalent to a saving of over Rs. 48 crores in foreign exchange.
In terms of food production it means over 27 lakh tons more food, valued at over Rs. 78 crores.
Sindri is thus helping the farmer, the backbone of the country, to retrieve his stature and gain new strength, thereby putting India's economy on a solid foundation.
Sindri Fertilizers & Chemicals (Private) Ltd.
MINISTRY OF PRODUCTION,
GOVERNMENT OF INDIA.



A view of the operation of crossing a stream with an 8" pipeline

NATURAL GAS IN INDUSTRY

India's Second Five-Year plan envisages the exploitation and development of all power resources, including natural gas.

Italy is rich in natural gas.

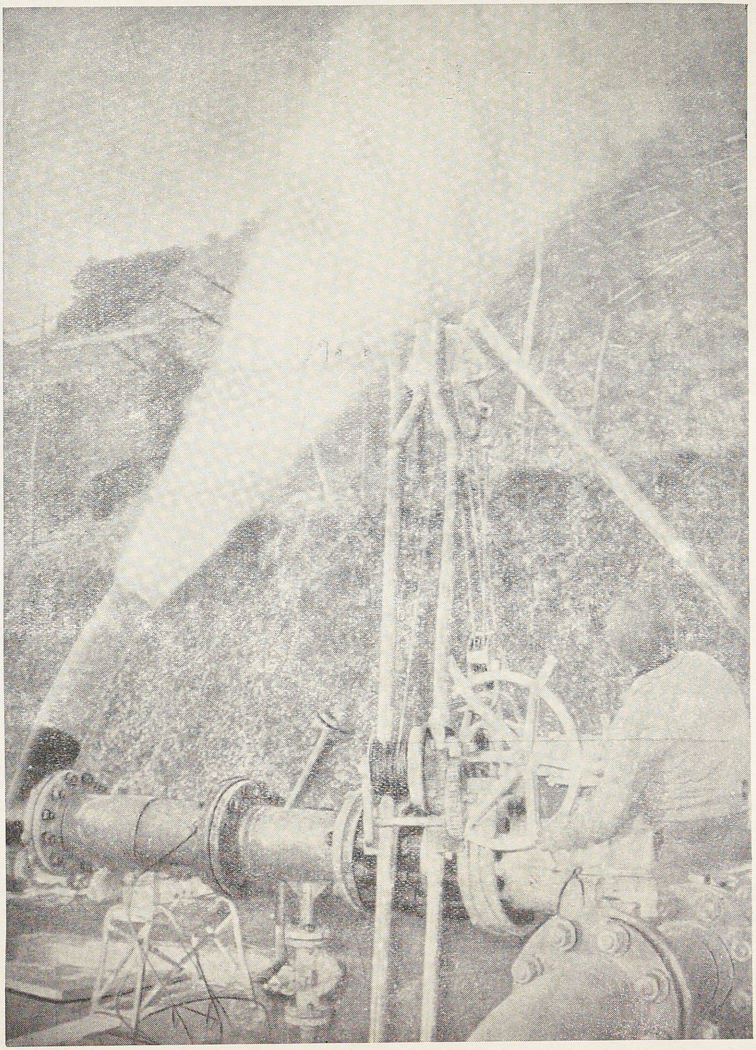
Natural gas ensures a more uniform distribution of temperature in the combustion chamber, a reduction in the cost of plant maintenance, elimination of the storage problem, with saving in investments.

In Italy today 2,000 factories are run on methane.

Natural gas does not contaminate steel. The absence in the combustion products of ashes and corrosive compounds lengthens the life of the refractory material of the furnace.

In producing paints, plastics, glass, ceramics, bricks the utilization of natural gas has tremendous values.

The natural gas reaches Genoa in Italy. The great 16" trunk line linking the Ligurian capital with the Cortemaggiore field came into operation on 31st December, 1954



HAL is now a renowned unit of aircraft manufacture, unique of its kind anywhere between Cairo and Tokyo.

INDIA'S AVIATION INDUSTRY

Major M. V. SUBRAHMANYAM

Publicity Officer, Hindustan Aircraft (P) Ltd., Bangalore

To Bangalore was given the distinction of being the home of the first Aircraft Industry in the East and Hindustan Aircraft Ltd., was established by Seth Walchand Hirachand on the 24th December 1940 in collaboration with the Government of Mysore. Mr. W. D. Pawley of the Inter Continent Corporation, the well-known American leader in Aircraft Industry, was entrusted with the construction of the plant in Bangalore, and thereby an era of Indo-American co-operation was inaugurated.

Shortly after the establishment of the factory, the Government of India became a member of the Company, and a year later the factory was taken over by them completely, so far as the private holdings were concerned. The only two present members are the Government of India and the Government of Mysore. The authorised capital of the Company is Rs. 18 crores. Of the paid up capital of about Rs. 6 crores, the major portion is held by the Government of India.

Barely eight months after the inception of the factory, the first aircraft was assembled and flown. In 1943 with the war in South East Asia in full swing, the U.S. Army Air Force, faced with colossal aircraft repair and overhaul requirements took over the Management of HAL from the Government for the duration of the war. All aircraft manufacturing programmes were suspended and the factory began to work round the clock in three shifts. The man power strength of the factory reached the figure of 15,000. A separate engine

overhaul department was formed with the target, in due course, to overhaul 300 Aero Engines a month.

With the termination of the war in 1945, the management of HAL reverted to the Government of India.

The Aircraft Technical Mission from the U. K. which visited India at the initiative of the Government of India in 1946, had no hesitation in recommending that HAL should become the nucleus for the development of aircraft manufacture in India.

With its future decided, HAL began to forge ahead. The first step taken was the formation of a Sales Department and HAL started operations as a commercial undertaking. To start with, an order from the Indian Air Force was received for the repair and erection of 100 Tiger Moth aircraft.

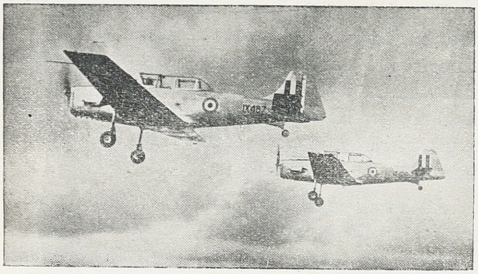
The following year, the year of India's Independence, HAL was recognized as the authorised Douglas Service Centre in India. More orders were received from the I. A. F., this time, for the overhaul of Dakotas and later for the manufacture of Percival Prentice Trainer Aircraft.

At the same time a full fledged Engineering and Design Department was formed at HAL.

The following year (1948) constituted another landmark in the development of the factory when it took in hand the designing of its own Trainer Aircraft, designated H. T.—2.

In 1950, HAL was admitted as a Member of the Society of British Aircraft Constructors.

1951 marked another notable step forward in the development of the industry with the building and erection of Jet Fighter Aircraft entrusted to it by the I. A. F.



Two HT-2 Trainer aircraft in flight

On the side of training, a 'Training within Industry' scheme, under the auspices of the International Labour Organisation was introduced at the upper level of Management with the intention ultimately to extend it to all supervisory personnel. Also Engineering Designers and technicians were deputed to the U. K. to familiarise themselves with the latest production methods in use in U. K. factories.

In 1952 the second prototype of the HT-2 was test flown. More and more special conversion of Dakotas for the I. A. F. were undertaken while Aerial Survey Camera modifications were carried out in one Liberator and three Dakota aircraft.

1953 may rightly be described as the year of the H. T.—2.

The year also marked the completion of the manufacture and delivery of Percival Preatice Aircraft to the I. A. F.

Machine Shop

Also the first *Jet Fighter manufactured by HAL* was successfully test flown and delivered to the I. A. F. HAL now was awarded the Service Station Certificate for American aircraft by the U. S. Civil Aeronautics Administration and thereby became the first organisation in Asia to achieve this distinction.

In November 1955 an HT-2 from Bangalore covered the countries of Burma, Thailand, Cambodia, Singapore and Malaya on a demonstration tour, flying 4,000 miles in 54.8 hours which included 16 hours for demonstration. Wherever it went, the HT-2 created a big impression and HAL is hoping to market in due course, the HT-2 in this far flung territory. Already Singapore is using an HT-2 for its training programme with an Indian Instructor, under the Colombo Plan. Australia too has evinced interest in this aircraft and an HT-2 is now visiting Australia and New Zealand on a demonstration tour.

Last year (1957) Licence negotiations were completed with Folland Aircraft Company for the manufacture by HAL of Britain's latest Light Jet Fighter, the 'Gant'. Arrangements were also finalised in collaboration with the Bristol Aero Engine Company for the manufacture of Jet Engines, the first of which will be the 'Orpheus'. A team of British experts arrived in Bangalore and few HAL engineers were deputed to England to familiarise themselves with the production aspects of the Gnat and the Orpheus. Thus on the foundation stone that was laid 17 years ago, now stands a huge edifice which is bound, as years advance, to add to itself new wings and new columns. To-day HAL has come of age and stands poised at the threshold of a new era in its history-jets and who knows missiles too!

Apart from serving as the main overhaul base for internal, Service and Civil aircraft, HAL has all along been also the pivotal point in the East for the repair and overhaul of aircraft from our overseas customers like Ethiopia, Saudi Arabia, Afghanistan, Iran, Ceylon, Burma, Indo-China etc. This branch

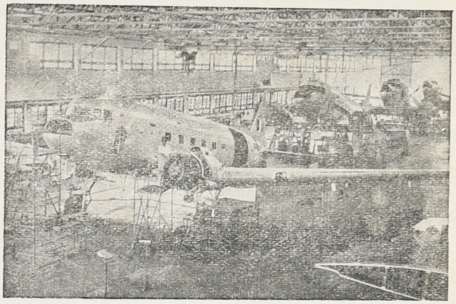
of her activity is tending to grow rather than diminish.

In 1952 a branch of the factory was set up at Barrackpore, near Calcutta, as the first measure of the eventual bifurcation of the two activities - Manufacture and Overhaul. The choice of Barrackpore was influenced by its proximity to our neighbours in South East Asia. This branch has been functioning mainly as an overhaul base for civillian, internal as well as overseas, and Service Aircraft. For the convenience of overseas operators there is an arrangement whereby overhauled engines can be despatched in advance of receipt of repairable units. The work at Barrackpore has been steadily growing and the time is not far off when the entire work of overhaul will be shifted to Barrackpore.

HAL has been maintaining, since 1948, its own technicians for the servicing and maintenance of service aircraft at the following IAF bases-Poona, Jodhpur, Agra, Barrackpore, Jorhat, Begumpet and Cochin (Naval air Wing).

HAL is also unique in that, unlike anywhere else in the West, it is a comprehensively self-contained unit, performing within its precincts, the functions of repair, overhaul and manufacture. As it has developed, it has equipped itself with all the ancillary workshops necessary, with the most up-to-date facilities and with skilled and highly experienced technicians in charge, for the repair, overhaul, erection and manufacture of aircraft, aero engines etc. Except for a small number of proprietary parts which have either to be purchased locally or imported from abroad, every repair or overhaul or manufacturing project, be it major or minor, is completed within the factory itself by its own workers and technicians with the available tools and raw materials.

Special mention of the foundry at HAL is called for. In the last few years there has been developed an up-to-date foundry which has been producing all kinds of ferrous and non-ferrous castings for aircraft like Vampire, HT-2 etc, and rail coaches. The foundry is making

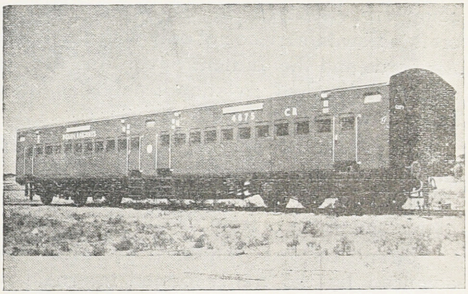


Dakota Overhaul Hangar

ferrous as well as non-ferrous castings for the production requirements of Hindustan Machine Tools, Bharat Electronics, etc., sister concerns owned by the Government of India.

In fact no visitor to the factory would fail to be struck by the manifold services rendered by the different workshops and the way they are run by the maintenance services in the factory. Installation, renovation and general day-to-day maintenance of a variety of machinery, mechanical, pneumatic or electrical, as well as checking up for snags and defects and rectifying them them are the main functions of these services.

It would be of interest to the reader that the current price of our services compare very favourably with, and are in fact, much cheaper than similar charges abroad. The same is also true of our Trainer aircraft the HT-2



All-metal rail coach

and the Vampire which are far cheaper than the prices of their overseas counterparts.

HAL has contributed, in a large measure, to the setting up of the Institute of Industrial Management which is a country-wide organisation in India, and which is a forum for the exchange of views and information on how best to run an industrial undertaking.

Another innovation made by HAL in keeping with modern trends is the *mechanisation of its accounting procedure*. HAL has in operation a sufficiently comprehensive costing and cost-controlling system aided by the latest automatic machines.

The Apprentice Training scheme which was inaugurated eight years ago is forging ahead. Particularly in an industry like that of HAL, it has been found advantageous to train its own technicians under various apprentice schemes which are pre-planned and which also include training in various other technical institutions in the country.

The " Training within Industry " programme is also making steady progress. Introduced first under the auspices of the International Labour Organisation, it originally covered the upper level of management percolating gradually thereafter down to the supervisory personnel.

HAL's chief claim to recognition in the sphere of aircraft production is based on its HT-2, a modern, basic, all-metal trainer aircraft which has made for itself among its training compeers elsewhere in the world. This aircraft is now in service not only with the Indian Air Force and the Indian Naval Air Arm but also with the Civil Aviation Establishments in India as well as Flying Clubs.

In yet another sphere, HAL has played a notable role-the development of Civil Aviation in INDIA owes not a little to the considerable assistance given to it by HAL.

Army Dakotas rendered surplus were acquired by the newly formed internal Civil Airlines in India and all these aircraft which had been in different stages of repair, were completely overhauled and converted into passenger airliners.

HAL had, as early as 1947, set up a full fledged engineering and design department with Dr. Ghatage as Chief Designer.

HAL has engaged a team of aeronautical experts from abroad under the leadership of an eminent German aircraft designer, Dr. Kurt Tank.

On the side of research, HAL has the advantage of being able to work in close collaboration with the Aeronautical Engineering Department of the Indian Institute of Science which is also located at Bangalore.

From now on, the main emphasis at HAL will be on MANUFACTURE-writ large.

As for the future, keeging in step with the latest developments in the field of aviation production, HAL will shortly be launching upon a new lines of manufacture-more up-to-date jet fighters. As already referred to plans have been finalised for the production under licence, of Folland's modern light jet fighter, the 'Gnat' and its power plant, the Bristol Orpheus Jet Engine. The first Indian built 'Gnat' and the Orpheus Engine will be available by about 1961.

At the same time plans having already been finalised, work is progressing steadily on the development of an advanced jet trainer, a modern medium transport aircraft etc.

HAL will continue to function, in the future, as in the past, as the main repair and overhaul organisation of aircraft-Military and Civil-Indian and overseas-in this part of the world.

In the short span of seventeen years, from being a repair, overhaul and assembly depot, HAL has grown into an important unit of manufacture, unique of its kind anywhere between Cairo and Tokio, to meet not only the Defence and Civilian requirements of India but also to market some of its products overseas and make its specialised services available to overseas customers. It has, over the past several years, acquired a reputation and set up a tradition which have assured for it a high place among the aircraft industries of the world.

* * *

Great is the future of Indian Industries when the researches of this laboratory start bearing fruit.

THE ROLE OF NATIONAL METALLURGICAL LABORATORY IN THE INDUSTRIAL EXPANSION OF INDIA

Introduction

Just over seven years ago, the National Metallurgical Laboratory was established by the Council of Scientific and Industrial Research to foster metallurgical research in India on an organised basis by undertaking fundamental and applied problems and to serve as a Central Station for carrying out researches on ores, minerals, refractories, ferrous and non-ferrous metals and alloys in relation to their application to the indigenous metal industries. Situated at Jamshedpur, the steel town of India, this laboratory was opened by the Prime Minister, Shri Jawaharlal Nehru on November 26, 1950.

The Laboratory is fully equipped on modern lines to undertake both fundamental and applied problems. The research and other activities of the Laboratory are conducted in seven main divisions under the guidance of Dr. B. R. Nijhawan, Director of the Laboratory. Close collaboration is maintained with other research institutions and organisations of the Council, particularly on long-term research projects of fundamental nature. Collection of data and technical information and dissemination of the results of scientific research to the industries so as to function as a clearing house for information; providing facilities for undertaking problems of fundamental and industrial importance through a system of industrial Fellowships for University Graduates, are amongst the many activities of this Laboratory.

Research Programme and Progress Achieved

The research and development work in general has been streamlined to suit the requirements of Five Year Plans in relation to mineral and metal development, on the basis of the industrial policy of the Governmet of India to find effective uses for indigenous minerals and alloys and to find substitutes for such of those we do not possess. These efforts are now being stepped up pari-passu with the development of metal industries getting into their strides under the stimulus of Five Year Plans towards rapid development of heavy industries such as iron and steel, aluminium, zinc, copper etc.

Thus during the seven years of existence, this laboratory has undertaken pioneering research and development work in the fields of mineral and metal industries which form the backbone of the Second Five Year Plan. The Second Five Year Plan deals basically with the setting up of heavy and engineering industries.

In order to do so, systematic assessment of mineral resources, utilisation of raw materials and development of substitute alloys to cut down imports of important alloys which we lack, have to be done. The National Metallurgical Laboratory has been playing an exceedingly useful role in fulfilling these objectives. Its activities have ranged far and wide, educative in one direction like holding Symposia annually on subjects of topical importance, to short and long term research and pilot plant investigations on mineral beneficiation, development of substitute alloys, utilising alloying elements readily available to the exclusion of those that are scarce in our country. These investigations are then translated into pilot plant projects and currently heavy pilot plants are in the process of being set up relating to mineral and thermal beneficiation of ores, refractories and aluminising of steel.

Some Outstanding Achievements

Some particulars of the work which has been pursued systematically yet enthusiastically are outlined in brief, the most important of which relates to the development of nickel free stainless steel, development of mineral beneficiation techniques for upgrading of low grade indigenous ores inter alia of manganese, chromite and graphite, production of electrolytic manganese and manganese dioxide, development of refractories and graphite crucibles, L. D. process of steel making and low shaft furnace project.

Studies into the fundamentals of metallurgical phenomena such as physics of metals and chemistry of metallurgical reactions have also been concurrently pursued with equal vigour and enthusiasm.

Nickel free Stainless Steel

Development of Nickel free Austenitic Stainless Steels is an achievement of very great significance not only to this laboratory but also to the country as a whole, as it is now possible to make stainless steels from totally indigenous alloying elements without adding an ounce of nickel. India possesses no sources of nickel and imports about 7,000 tons of nickel-bearing austenitic stainless steel chiefly in the form of sheets annually. These new stainless steels developed by this laboratory, can successfully replace the 18:8 chromium nickel steels in many applications and hence their manufacture in India can save about 7 crores of foreign exchange per annum and at the same time will help in conserving nickel which is a strategic metal.

These new stainless steels are based on chromium-manganese and nitrogen. Copper may also be added if enhanced corrosion resistance is desired. The unique feature of these stainless steels is their high nitrogen content by virtue of which it has been made possible to produce steels of as high a chromium content as 22%, completely austenitic and non-magnetic, dispensing entirely the use of nickel. These stainless steels possess excellent deep drawing properties. They also possess adequate corrosion resistance to boiling nitric acid, organic acids (e.g. citric acid, acetic acid, etc.), marine and industrial atmospheres including sulphurous atmosphere. These stainless steels can be used for all kinds of utensils in Indian household including tumbler, thalis, katories, spoons, pots, pressure cookers, cooking ranges, restaurant flat ware, etc. For wash-basins, lavatory pans and for similar other railway fittings on the Indian coaches, these steels will prove equally useful. They may also be used for hospital wares, dairy equipment, decorative and architectural parts, steel furniture, high strength structural members, etc., and for applications requiring metals with low magnetic permeability. These substitute steels can also be work-hardened to tremendous strength. In the cold-drawn state, these steels can develop ultimate strength of over hundreds of thousand pounds. In high temperature oxidation and scaling these steels are superior to nickel-bearing 18:8 chromium nickel stainless steels.

Beneficiation of Low-grade Manganese, Chromite and other ores

Valuable work has been done on the beneficiation of low-grade manganese ores on all-India basis particularly on the amenability of low-grade ores to various beneficiation methods, and processes have been evolved whereby the manganese content could be increased to 48% and above, thus making them suitable for ferro-manganese manufacture. The task undertaken was by no means easy as no two ores have been found alike and each ore has to be tested separately to determine its beneficiation characteristics and arrive at the best flow-sheet for upgrading each of them to the required specifications. During the course of this investigation, a number of commercial concerns and State Governments have sought the advice of this laboratory for

putting up large size plants and selection of suitable machinery and flow-sheets for upgrading manganese ores on a large scale. A monograph embodying the results of this extensive work carried out by the Laboratory giving full statistical data on the production and export of manganese ores in India is now under publication and will be the first of its kind so far attempted.

Besides, beneficiation work on chromite ores of Mysore, Orissa and Bihar, graphite from indigenous origins; wolfram from Rajasthan, casseterite from Bihar, pyrite and sulphur from Mysore, Bombay and Bihar; vermiculite from Mysore and West Bengal; Kyanite from Mysore and gypsum from Rajasthan are among the multitude of beneficiation work done on the low grade ores of the country.

Much of these investigations, particularly the concentration of manganese ores high in iron and treatment of low grade manganese, chromite and other indigenous ores are now being translated into semipilot plant scale before releasing them for commercial exploitation.

Sintering of Iron ore fines

Although India is rich in iron ore deposits, iron ore fines are unsuitable for charging in blast furnace for smelting operation. A detailed study has therefore been made in the National Metallurgical laboratory on the sintering characteristics of iron ores of Rajharaphar, Madhya Pradesh and other raw materials to be used in the Bhilai Steel Plant. Optimum conditions to get a good porous sinter utilising the indigenous materials have been determined. A sintering furnace for this purpose has been designed and fabricated in this laboratory. On the basis of the work done by this laboratory it would be possible to utilise the iron ore fines for the extraction of iron which is another milestone in the progress of iron and steel metallurgy in India.

Electrolytic Manganese

Production of electrolytic manganese metal of 99.95% purity from low-grade manganese ores is another significant contribution the laboratory has made for the metal industries. Exploitation of the process will help in utilising country's huge manganese ore deposits. Since this electrolytic manganese metal can be for the production of nickel free stainless steels and for the production of coinage alloys, substituted brass and other non-ferrous alloys in the country, there will be a great demand of this metal. If this process is industrially developed India can save foreign currency in the first instance and ultimately can earn even dollars, by exporting manganese to overseas countries for which the prospects are bright.

Electrolytic Manganese dioxide

High purity electrolytic manganese dioxide suitable for use in dry cells has been successfully prepared. Commercial exploitation of the process can immediately put a stop to the import of about 6,000 tons per year of manganese dioxide, of which 4,000 tons are used by dry cell industries alone. Saving in foreign exchange to the extent of about a crore of rupees per annum, can be achieved by the development of this process.

Development work on Refractories

A number of refractory minerals like, sillimanite, magnesite, bauxite, etc. were investigated for the production of suitable refractory materials which can be profitably used for metallurgical plants in this country. The chief features of the development work carried out by this laboratory consist in the fact that such refractories could be producd from indigenous sources especially those that find no use at present. As for example, forsterite refractories, sillimanite refractories, carbon refractories, super-duty insulation refractories etc. have been successfully developed utilising raw materials found in abundance in the country.

Graphite Crucibles

Work has also been in progress in the National Metallurgical Laboratory on both clay bonded as well as carbon bonded graphite crucibles. Processes for this manufacture have now been successfully worked out and crucibles of commercial size have been made. Test reports on the actual service performance of these crucibles showed that they are more economical and possess by far longer life than the imported graphite crucibles now used in this country. At present a large proportion of of the country's requirement is being met with by imports which on an average amounts to about 700 tons, costing more than a million rupees.

Assessment of indigenous Foundry Moulding materials

To meet the needs of the fast-progressing foundry industry, a long-term project was initiated on the assessment of moulding characteristics of various Indian Foundry sands and bonding materials for their suitability in iron, steel and non-ferrous foundries. The valuable data so useful for standardising the sand plant practice have been made available to all the foundries in India, and this work has won outstanding recognition from all the Indian Foundrymen.

Production of Oxygen-blown Steel from Indian Pig Iron (L.D. Process)

A history in steel making in this country and a milestone in the research activities of the National Metallurgical Laboratory were made by producing refined steel from Indian pig iron by high pressure oxygen injection techniques in a specially designed converter similar to that of the well-known L. D. converter. Designed and fabricated in the National Metallurgical Laboratory, this is the first of it kind to be installed on a pilot plant scale in India. The L. D. process of making oxygen blown steel has been widely employed in Austria and in the continent. The chief advantages for employing this process in this country lie in the fact that the Indian pig iron which has high silicon and medium phosphorus content and cannot be straightway processed either in acid Bessemer process or in basic Thomas process, can be successfully processed in a single operation producing refined steel of very low silicon, phosphorus, carbon and nitrogen content. A continuous operation will give much greater output by this process due to much shorter time (10-17 minutes only) which oxygen injection requires, for refining pig iron to steel.

The L. D. converter installed in this laboratory is basic lined and has been designed to treat upto 0.1 ton of molten metal per blow. Practical trials with this converter have been very succcessful and have yielded useful data which can be profitably utilised in India's steel expansion programme.

Low Shaft Furnace Project

Bearing in mind the reserves of coking coal in relation to the expansion of iron and steel industry in India, the National Metallurgical Laboratory is now installing a 15 tons per day pilot Low-Shaft Furnace Plant, primarily to investigate the possibilities of obtaining commercial grades of pig iron from fine grained or soft haematite iron ores or other low grade iron ores and non-coking high ash coals, coke breeze or other solid fuels like carbonised lignite, plentiful supplies of which are available in India but are unsuitable for smelting in the conventional blast furnace. Production of standard grades of ferromanganese from low and medium grade manganese ores and non-coking coals is also envisaged.

For a country like India where large amounts of high grade iron ore are available but the coking coal is scarce coupled with the difficulties of transportation of raw materials and finished products over long distances, the advantages and potentialities of smelting of iron ores in low-shaft furnaces by a process appropriate to the local conditions of raw-materials will be obvious.

Aluminising of Steel

Aluminising of steel by hot-dip method utilising halide, organic and aqueous fluxes has successfully been developed on a laboratory scale and forms the basis of three patents. Aluminised articles can be used under corrosive atmosphere and can find variety of uses in various industrial applications such as in telegraphic wires and poles and related fields. The superiority of aluminised steel over the galvanised ones is well-known. India is meeting her requirements of zinc chiefly by imports whereas aluminium ores are abundant in India. The utilisation of this patented process for aluminising can thus conserve the country's demand for zinc.

New Plating Techniques

New plating techniques for plating metals like Ni, Cr on Al and also non-metals including brass from non-cyanide baths have been developed and considerable interest has been shown by the industries in India to exploit these processes.

Liquid Gold

A process has been developed for the production of liquid gold comparing favourably with the imported variety. Foreign exchange to the extent of about Rs. 75 lakhs to Rs. 1 crore can be conserved, once this process is put into industrial practice.

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